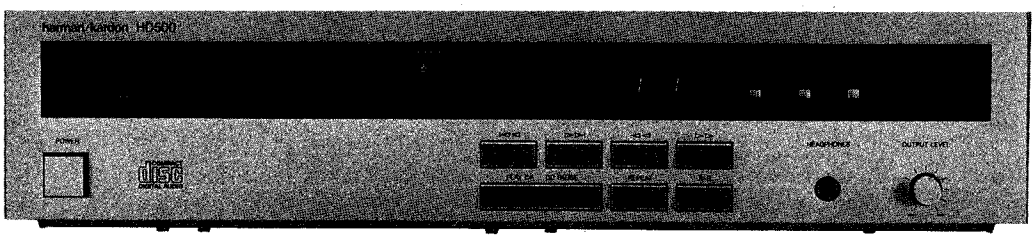
The Harman Kardon
Model HD500

Manual 96A

COMPACT DISC PLAYER

Technical Manual



SPECIFICATIONS

System	Compact Disc Digital Audio
Signal Detection	3-Beam Semiconductor Laser
Error Correction	CIRC System
Sampling Frequency	44.1kHz
Quantization	16 Bit Linear
Channels	2 Channel Stereo
Frequency Response	4—20,000 Hz ±0.5dB
Total Harmonic Distortion	0.01% (1kHz)
Dynamic Range	94dB
Signal-to-Noise Ratio	100dB
Channel Separation	83dB (1kHz)
Wow & Flutter	Immeasurable
Line Output Level/Load Impedance	Variable, Max. 2.4V/10k Ohms
Headphone Output Level/Load Impedance	25mW/32 Ohms
Power Requirements	
USA & Canada models	AC 120V, 60Hz
General model	AC 100/120/220/240 V, 50/60Hz
Power Consumption	20 W
Dimensions (W x H x D)	17-1/2" x 4-1/16" x 13-3/16" (443 x 103 x 335 mm)
Weight	12.8lbs (5.8kg)
Accessories	Stereo Connecting Cords Remote Control AA Battery (x 2)

All specifications and features subject to change without notice.

harman/kardon

240 Crossways park West, Woodbury, N. Y. 11797
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SAFETY PRECAUTIONS

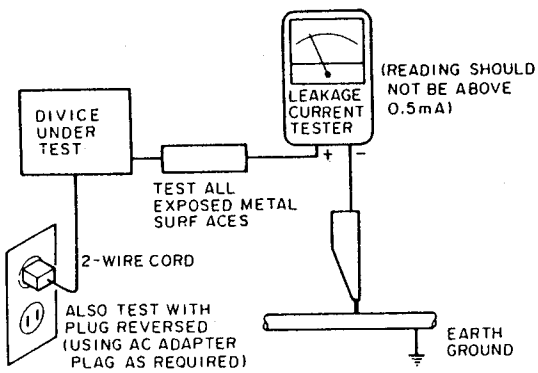
Before returning an instrument to the customer, always make a safety check of the entire instrument, including, but not limited to, the following items:

a. Be sure that no built-in protective devices are defective and/or have been defeated during servicing.
   (1) Protective shields are provided to protect both the technician and the customer. Correctly replace all missing protective shields, including any removed for servicing convenience.
   (2) When reinstalling the chassis and/or other assembly in the cabinet, be sure to put back in place all protective devices, including, but not limited to, nonmetallic control knobs, insulating fishpapers, adjustment and compartment covers/shields, and isolation resistor/capacitor networks. **Do not operate this instrument or permit it to be operated without all protective devices correctly installed and functioning.**

b. Be sure that there are no cabinet openings through which an adult or child might be able to insert their fingers and contact a hazardous voltage. Such openings include, both are not limited to, excessively wide cabinet ventilation slots, and an improperly fitted and/or incorrectly secured cabinet back cover.

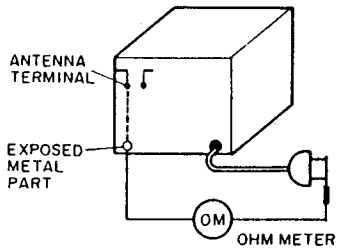
c. **Leakage Current Hot Check** — With the instrument completely reassembled, plug the AC line cord directly into a 120V AC outlet. (Do not use an isolation transformer during this test.) Use a leakage current tester or a metering system that complies with American National Standards Institute (ANSI) C101.1 "Leakage Current for Appliances" and Underwriters Laboratories (UL) 1270, (34.6). With the instrument AC switch first in the ON position and then in the OFF position, measure from a known earth ground (metal waterpipe, conduit, etc.) to all exposed metal parts of the instrument (antennas, handle bracket, metal cabinet, screwheads, metallic overlays, control shafts, etc.), especially any exposed metal parts that offer an electrical return path to the chassis. Any current measured must not exceed 0.5 milliamp. Reverse the instrument power cord plug in the outlet and repeat test. **ANY MEASUREMENTS NOT WITHIN THE LIMITS SPECIFIED HEREIN INDICATE A POTENTIAL SHOCK HAZARD THAT MUST BE ELIMINATED BEFORE RETURNING THE INSTRUMENT TO THE CUSTOMER.**

AC Leakage Test



d. **Insulation Resistance Test**
   (1) Unplug the power supply cord and connect a jumper wire between the two prongs of the plug.
   (2) Turn on the power switch of the instrument.
   (3) Measure the resistance with an ohmmeter between the jumpered AC plug and each **exposed metallic** cabinet part on the instrument, such as screwheads, antenna, control shafts, handle brackets, etc. The reading should be as shown below. If it is not within the limits specified, there is the possibility of a shock hazard, and the instrument must be repaired and rechecked before it is returned to the customer.

e. **Insulation Resistance Test Cold Check**
   (1) Unplug the power supply cord and connect a jumper wire between the two prongs of the plug.
   (2) Turn on the power switch of the instrument.
   (3) Measure the resistance with an ohmmeter between the jumpered AC plug and each **exposed metallic** cabinet part on the instrument, such as screwheads, antenna, control shafts, handle brackets, etc. When the exposed metallic part has a return path to the chassis, the reading should be between 1 and 5.2 Megohm. When there is no return path to the chassis, the reading must be "infinite". If it is not within the limits specified, there is the possibility of a shock hazard, and the instrument must be repaired and rechecked before it is returned to the customer.



2. PRODUCT SAFETY NOTICE

Some electrical and mechanical parts have special safety related characteristics which are often not evident from visual inspection, nor can the protection they give necessarily be obtained by replacing them with components rated for higher voltage, wattage, etc. Parts that have special safety characteristics are identified by shading, by (⚠) on schematics and parts listed. Use of a substitute replacement that does not have the same safety characteristics as the recommended replacement part might create shock, fire, and/or other hazards. Products Safety is under review continuously and new instructions are issued whenever appropriate.

3. SERVICING PRECAUTIONS

CAUTION: Before servicing instruments covered by this service manual and its supplements, read and follow the SAFETY PRECAUTIONS on this page. NOTE: If unforeseen circumstances created conflict between the following servicing precautions and any of the safety precautions, **always follow the safety precautions.** Remember: Safety First.

General Servicing Precautions

a. Always unplug the instrument AC power cord from the AC power source before:
   (1) Removing or reinstalling any component, circuit board, module, or any other instrument assembly.
   (2) Disconnecting or reconnecting any instrument electrical plug or other electrical connection.
   (3) Connecting a test substitute in parallel with an electrolytic capacitor in the instrument.
   Caution: A wrong part substitution or incorrect polarity installation of electrolytic capacitors may result in an explosion hazard.

b. Do **not** defeat any plug/socket B+ voltage interlocks with which instruments covered by this service manual might be equipped.

c. Do **not** apply AC power to this instrument and/or any of its electrical assemblies unless **all** solid-state device heat sinks are correctly installed.

d. Always connect a test instrument's ground lead to the instrument chassis ground **before** connecting the test instrument positive lead. Always remove the test instrument ground lead last.

NOTE: Refer to Safety Precautions on Page 3.
(1) The service precautions are indicated or printed on the cabinet, chassis or components. When servicing, follow the printed or indicated service precautions and service materials.
(2) The Components used in the unit has a specified conflammability and dielectric strength. When replacing any components, use components which has the same ratings. Components marked (⚠) in the circuit diagram are important for safety or for the characteristics of the unit. Always replace with the appointed components.
(3) An insulation tube or tape is sometimes used and some components are raised above the printed wiring board for safety. The internal wiring is sometimes clamped to prevent contact with heating components. Install them as they were.
(4) After servicing, always check that the removed screws, components and wiring have been installed correctly and that the portion around the service part have not been damaged and so on. Further check the insulation between the blades of attachment plug and accessible conductive parts.

Insulation Checking Procedure

Disconnect the attachment plug from the AC outlet and turn the power on. Connect the insulation resistance meter (500V) to the blades of the attachment plug. The insulation resistance between the each blade of the attachment plug and accessible conductive parts (Note 1) should be more than 1M-ohm.

Note 1: Accessible Conductive Parts including Metal panels, Input terminals, Earphone jacks, etc.

ELECTROSTATICALLY SENSITIVE (ES) DEVICES

Some semiconductor (solid state) devices can be damaged easily by static electricity. Such components commonly are called Electrostatically Sensitive (ES) Devices. Examples of typical ES devices are integrated circuits and some field-effect transistors and semiconductor "chip" components. The following techniques should be used to help reduce the incidence of component damage caused by static electricity.

1. Immediately before handling any semiconductor component or semiconductor-equipped assembly, drain off any electrostatic charge on your body by touching a known earth ground. Alternatively, obtain and wear a commercially available discharging wrist strap device, which should be removed for potential shock reasons prior to applying power to the unit under test.
2. After removing an electrical assembly equipped with ES devices, place the assembly on a conductive surface such as aluminum foil, to prevent electrostatic charge buildup or exposure of the assembly.
3. Use only a grounded-tip soldering iron to solder or unsolder ES devices.
4. Use only an anti-static solder removal device. Some solder removal devices not classified as "anti-static" can generate electrical charges sufficient to damage ES devices.
5. Do not use freon-propelled chemicals. These can generate electrical charge sufficient to damage ES devices.
6. Do not remove a replacement ES device from its protective package until immediately before you are ready to install it. (Most replacement ES devices are packaged with leads electrically shorted together by conductive foam, aluminum foil or comparable conductive material).
7. Immediately before removing the protective material from the leads of a replacement ES device, touch the protective material to the chassis or circuit assembly into which the device will be installed.
   CAUTION: Be sure no power is applied to the chassis or circuit, and observe all other safety precautions.
8. Minimize bodily motions when handling unpackaged replacement ES devices. (Otherwise harmless motion such as the brushing together of your clothes fabric or the lifting of your foot from a carpeted floor can generate static electricity sufficient to damage an ES device).

FEATURES

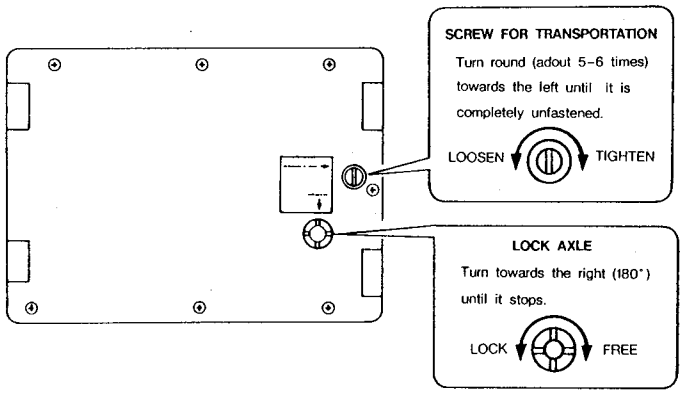
Performance Features

- 3-Beam Laser
- 16-Bit Linear Digital-to-Analog Converter with Digital Filter and 88.2kHz Sampling Frequency
- 4-Pole Analog Filter for Excellent Phase Response
- Ultrawideband, Discrete Analog Amplifiers for Low IM Distortion
- Output Level Control

Convenience Features

- Wireless Remote Control
- 15-Track Programability
- Auto Repeat
- Section Repeat
- Bi-Directional Track Skip
- Bi-Directional Audible Cueing
- Track/Time Display

IMPORTANT



Before plugging the unit in, be sure to loosen the transportation screw and the lock axle on the bottom of the unit with a screw driver.

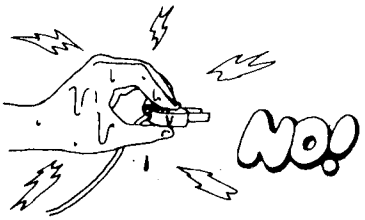
Note:

- Place a cloth under the unit in order to prevent it from being scratched.
- Turn the unit upside down.
- The screw and lock axle can not be removed.
- Be sure to tighten them by the reverse procedure before transporting the unit.

GENERAL INSTRUCTIONS

Safety Precautions

Be sure to observe the following precautions:



■ Power plug

Insert the plug firmly into the socket to avoid electric shocks. When removing the power plug from the wall socket, pull only on the plug head. Never pull the cord itself.

■ Do not open up the cabinet

To avoid electric shocks and fire hazards, do not open the cabinet and attempt to service or modify the unit yourself. Under no circumstances should the cabinet be opened.

■ Avoid touching with wet hands

To avoid the danger of electric shocks, do not touch the electric power cord with wet hands. Dry your hands thoroughly before handling the unit.
If you should accidentally spill water on the unit, contact your sales representative or the nearest authorized Harman Kardon service station.

■ Do not insert any foreign objects into the jacks or the ventilation openings of the unit.

■ Do not cover the ventilation openings

The upper and lower ventilation openings prevent the internal temperature from rising excessively. Therefore, do not place any objects where they will block the air flow from these openings.

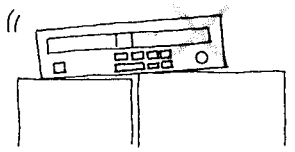
■ Do not place the HD500

- Directly on top of high power amplifiers and other heat generating components.
- On top of carpets or blankets.
- In a place where the air flow is restricted.
- Inside an enclosed space while it is in operation.

Failure to observe the above can cause malfunctions and fires.

■ Unit placement

To prevent the unit from dropping, do not place the HD500 in an unstable location, such as uneven or tilted surfaces.



■ Leaving the unit unattended

When leaving the unit unattended for a long period of time, such as when you are vacationing, be sure to remove the power cord from the wall socket.

Unit Placement

■ **Place the unit as far away as possible from tuners and TV sets.**

This unit uses high frequency signals and therefore accidental signal leakage can cause reception interference in tuners and TV sets. If such should be the case, move the HD500 further away from the tuner or TV set. If you are using an indoor antenna, this should be replaced with an outdoor antenna.

■ Avoid the following locations since not only will they lower the quality of the unit, but are hazardous as well.

Locations:

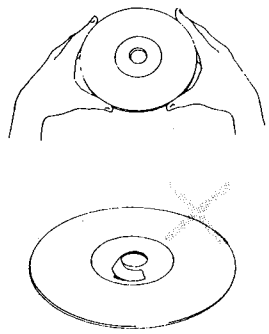
- Subject to high temperatures (in excess of 113°F/45°C). (Be especially careful during summer time.)
- Subject to direct sunlight.
- Excessively cold (under 32°F/0°C)
- Subject to high humidity.
- Close to heat sources.
- With excessive smoke and dust.
- Subject to vibrations.
- Tilted or uneven surfaces or other unstable positioning.
- Where strong magnetic fields are present.

Handling Compact Discs

Dirt, fingerprints, scratches and warps on a compact disc can cause noise. Observe the following precautions to keep your compact discs sounding their best.

■ **Handling compact discs**

Do not touch the playback surface (the rainbow colored side).
Do not attach adhesive tape, stickers, etc. to the disc label.

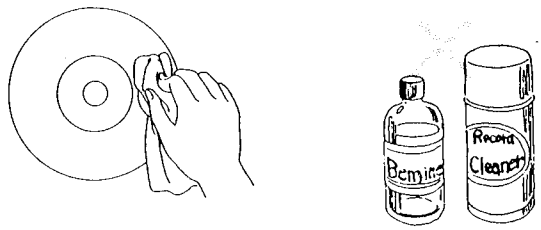


■ **Disc storage**

Avoid storing the discs in locations subject to high temperature, high humidity and direct sunlight. Also do not keep discs inside a closed vehicle as it is often subject to extreme temperatures.

■ **Disc care**

Before playing the disc, wipe off all dust, dirt and fingerprints on the playing surface with a soft cloth. Do not use benzine and record cleaners designed for analog records. Static prevention treatments can also damage compact discs and should therefore be avoided.



Only compact discs with the mark shown below can be used with the HD500.

COMPACT
disc
DIGITAL AUDIO

Handling Precautions

■ Dew formation

Window frames inside a warm room during winter will rapidly accumulate dew on the surface. This unit features a precision lens element. This lens element is also subject to dew formation under the following circumstances:

- When subject to sudden changes in temperature.
- When the room in which the unit placed is subject to high humidity.
- When moving the unit suddenly from a cold to a warm place.

The HD500 will not be able to correctly read the programs under these circumstances, and the player will not operate properly. In such cases, after turning the power switch on, wait for 20 to 30 minutes before operating the unit.

■ Do not remove the cabinet

This unit uses an invisible laser pickup to detect the signals recorded on the compact disc. The HD500 has been designed so that the laser rays will not radiate outside. To avoid laser exposure in case the safety interlocks are defeated or out of action, do not remove the cabinet.

■ Be careful of the laser pickup

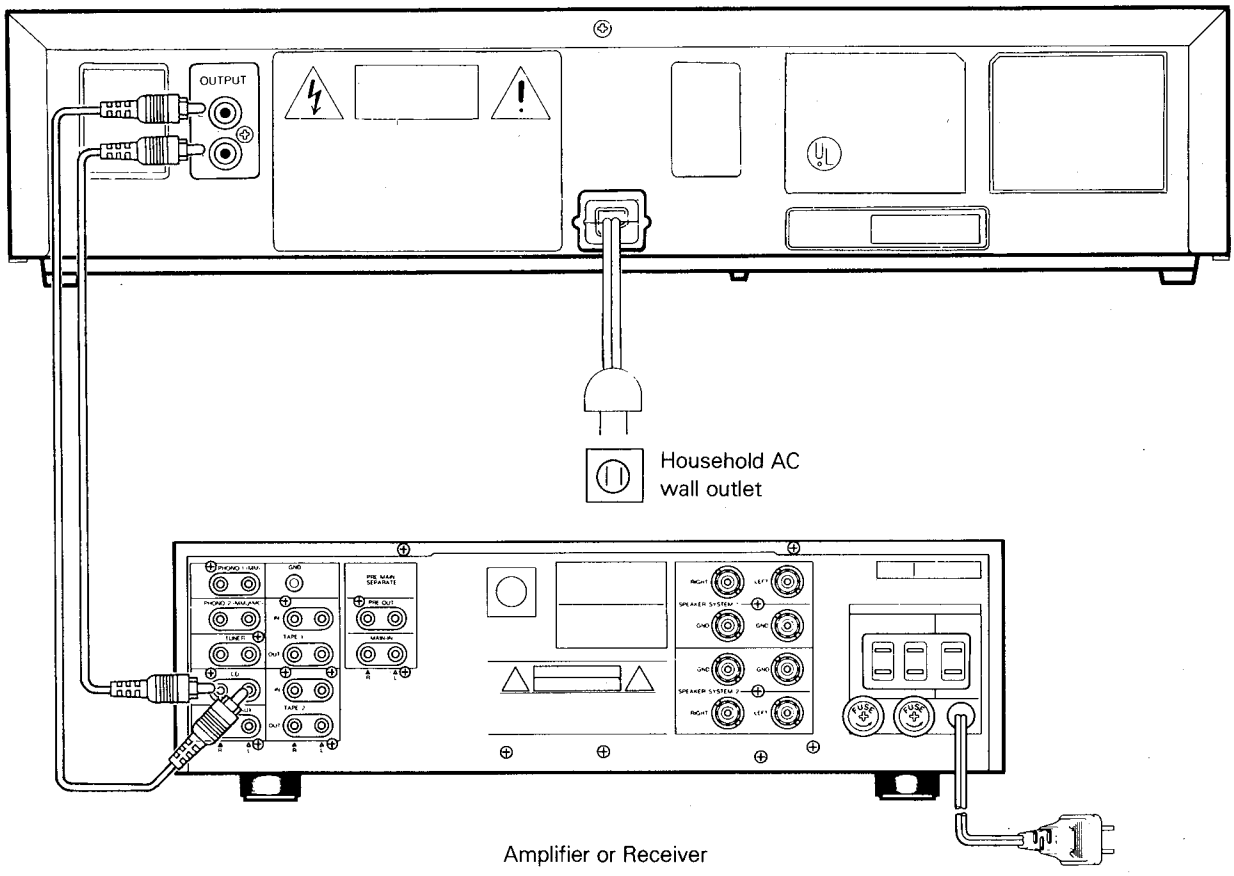
Although you cannot see it from the outside, a laser pickup is located under the disc tray and a precision lens is built in it. Since the laser pickup, including the lens element, is especially sensitive to dust, keep the disc tray closed when not in use. Also do not put your hand inside the unit.

Unit Care

■ Wipe off the cabinet with a soft, dry cloth

Do not apply alcohol, benzine, paint thinners, insecticides, other chemicals and adhesive tape to the cabinet, as these can remove the luster of the cabinet and can also impair the finish. Avoid chemically treated cloth as well.

CONNECTIONS



1. Using the supplied shielded cords with RCA-type plugs, connect the left (L) and right (R) OUTPUT jacks on the rear panel of the unit to the left (L) and right (R) input jacks (CD or AUX) or the TAPE playback jacks on the rear panel of the amplifier or receiver.
2. Plug the power cord of the HD500 into the convenience AC outlet on the rear panel of the amplifier or a household AC outlet.

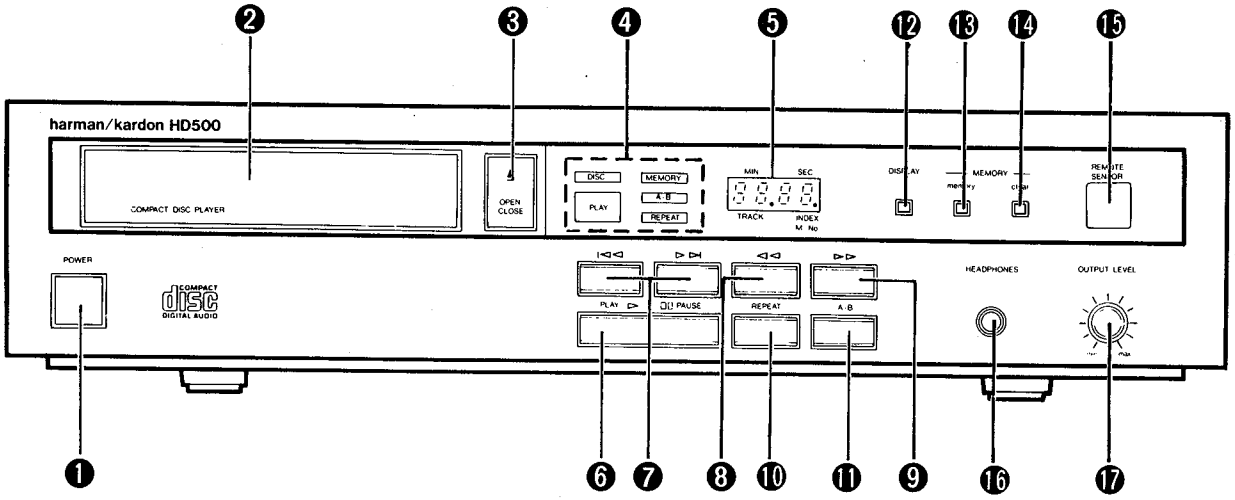
Notes on connection

- Turn off the power switch and disconnect the power cords of all components before making connections.
- Make sure that the left and right jacks of the HD500 are properly connected to the left and right jacks, respectively, of the amplifier or receiver.
- To avoid incomplete connections, be sure that the shielded cords with RCA-type plugs are fully inserted into the corresponding jacks.
- Do not connect the output of the CD player to the phonograph input of the amplifier.

Volume Setting

The digital recording format of compact discs enable them to accurately reproduce all peaks contained in the music signals without noise. Therefore, if attempting to adjust the volume setting as you would for analog record players and cassette tape recorders, by listening to the noise level, the sudden unexpected surge in the amplifier power may harm your speakers. Avoid excessively high volume setting.

CONTROLS AND FUNCTIONS



❶ POWER SWITCH

Press this switch to turn the power of the main unit on and off. Pressing it once will turn the power on, and pressing it once again will turn the power off.

❷ DISC TRAY

By pressing the OPEN/CLOSE button, the tray onto which the discs are loaded will slide out. (See page 9 for details of loading compact discs.)

❸ OPEN/CLOSE BUTTON

Press this button to open or close the DISC TRAY. Press it once to make the DISC TRAY slide out, and again to make the DISC TRAY slide in.

❹ FUNCTION DISPLAY

DISC

Flashes when DISC TRAY is opened or closed. The indicator will light up when the disc has been correctly loaded and the unit is in the standby mode. It will continue to be lit during playback.

REPEAT

Lights when repeat playback has been programmed.

A-B

Lights during repetition of one section of the disc.

PLAY

Lights during playback, or blinks when in pause.

MEMORY

Lights during memory playback.

❺ TIME/TRACK DISPLAY

Displays elapsed playback time from the beginning of the program being played, or displays the track and index number during playback.

❻ PLAY/PAUSE BUTTON

Press this button to start playback. Pressing this button during playback activates the pause mode. Playback continues when this button is pressed again. Playback stops if this button is held down for more than two seconds.

❼ PROGRAM SELECTION (SKIP) BUTTONS (⏮, ⏭)

⏮: Pressing this button once skips playback backward to the beginning of the present program. Holding the button down skips playback backward to the beginning of previous programs.

⏭: Pressing this button once skips playback forward to the beginning of the next program. Holding the button down skips playback forward to the beginning of subsequent programs.

❽ REVERSE BUTTON (◁◁)

Pressing this button starts low speed reverse. Holding the button down longer than three seconds changes the reverse mode to high speed. Sound can be heard at a reduced level in this mode.

❾ FAST-FORWARD BUTTON (▷▷)

Pressing this button starts low speed fast-forwarding. Holding the button down longer than three seconds changes the fast-forward mode to high speed. Sound can be heard at a reduced level in this mode.

⑩ REPEAT BUTTON
Pressing this button enables continuous repeat playback of the disc. Pressing this button again disables the repeat playback mode.

⑪ A–B REPEAT BUTTON
Use this button to specify the beginning and end points for section repetition.

⑫ DISPLAY BUTTON
Press to change the display. When pressed, display is switched between the elapsed playback time of a track and the program and index number.

⑬ MEMORY BUTTON
Used to program the memory for non-sequential playback of disc tracks.

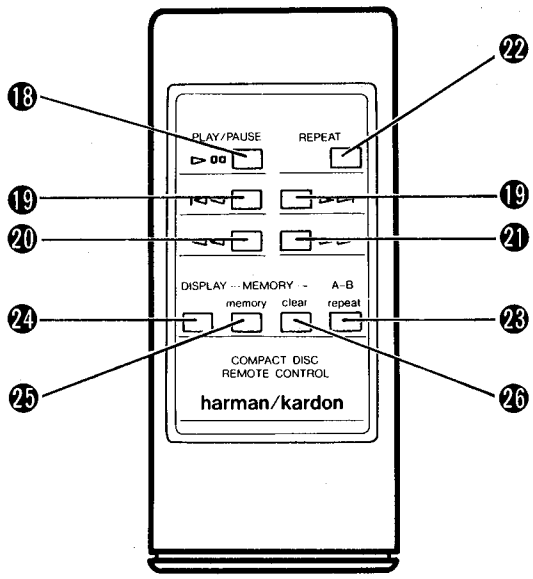
⑭ MEMORY CLEAR BUTTON
Pressing this button clears the entire contents of the memory.

⑮ REMOTE CONTROL SENSOR
Receives signals from the supplied remote control unit.

⑯ HEADPHONES JACK
Connect the headphone plug to this jack for private listening.

⑰ OUTPUT LEVEL CONTROL
This control adjusts the volume level of the rear panel OUTPUT jacks and the HEADPHONES jack. Volume increases when turned to the right.

Remote Control



⑱ PLAY/PAUSE BUTTON
Same as ⑥.

⑲ PROGRAM SELECTION BUTTON (⏮◁, ▷⏭)
Same as ⑦.

⑳ REVERSE BUTTON (◁◁)
Same as ⑧.

㉑ FAST-FORWARD BUTTON (▷▷)
Same as ⑨.

㉒ REPEAT BUTTON
Same as ⑩.

㉓ A–B REPEAT BUTTON
Same as ⑪.

㉔ DISPLAY BUTTON
Same as ⑫.

㉕ MEMORY BUTTON
Same as ⑬.

㉖ MEMORY CLEAR BUTTON
Same as ⑭.

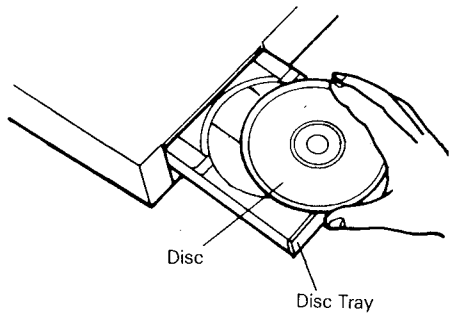
- When changing the batteries of the remote control, insert the batteries with their polarity aligned according to the diagram on the back of the battery case.
- 2 AA size (UM-3) batteries are recommended.

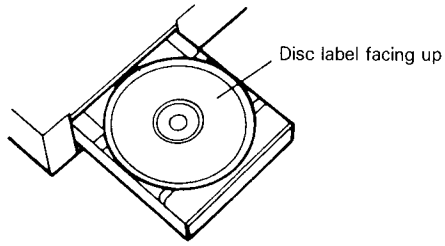
OPERATIONS

Loading Compact Discs

1. Press the POWER switch to turn on the power.
2. Press the OPEN/CLOSE button to slide out the DISC TRAY.
3. Place the disc label facing up.
   Center, the disc on the tray.
4. Press the OPEN/CLOSE button to close the DISC TRAY.

   Pressing the PLAY button even when the DISC TRAY is open, closes the tray and begins play-back from the first program.

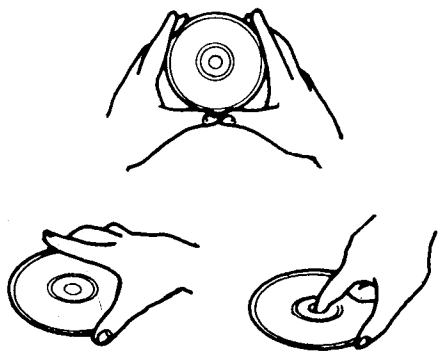




CAUTION

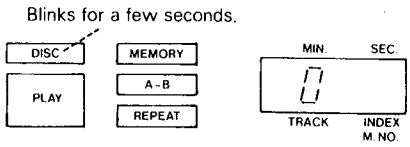
Wait until the disc holder is completely open before loading the compact disc. Failure to observe this precaution can result in damage to the disc.

To prevent fingerprints from getting on the disc, handle it only by the edges or center, as shown in the illustration below.



Playing a Disc

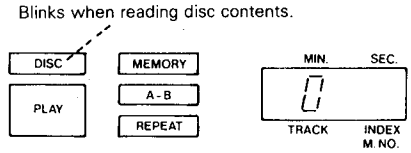
1. Press the POWER switch.

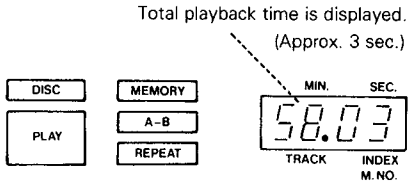


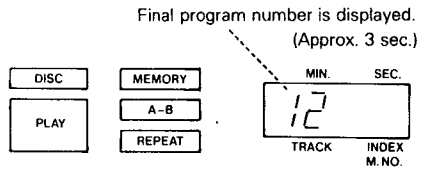
2. Press the OPEN/CLOSE button.
(DISC TRAY opens)

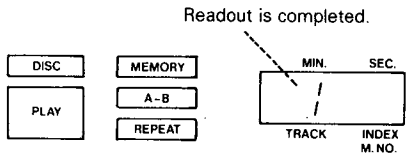
3. Carefully insert disc.
(Label side up)

4. Press the OPEN/CLOSE button.

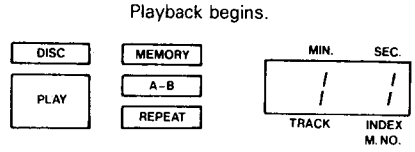








5. Press the PLAY/PAUSE button.



- The DISC TRAY will also close if step 5, pressing the PLAY/PAUSE button, is carried out instead of step 4. In this case, the unit will directly commence playback from the beginning of the first program.

- To Temporarily Halt Playback
Pressing the PLAY/PAUSE button causes the unit to enter the pause mode. The PLAY indicator will blink. Pressing the PLAY/PAUSE button again defeats the pause mode and re-enters the play mode.

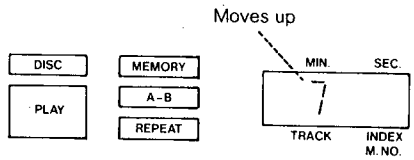
- Stopping Playback
When the PLAY/PAUSE button is pressed for more than 2 seconds, the disc stops turning and the unit enters the ready mode.

- Removing a disc
Pressing the OPEN/CLOSE button opens the DISC TRAY.

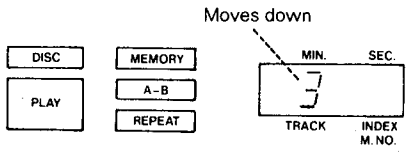
Desired Program Playback

This feature allows you to move forward or backward directly to a desired program, skipping the rest. This function can be activated from any mode (disc set, play, pause).

1. To skip forward, press the ▷▷| button until the desired track appears in the DISPLAY.



2. To skip backward, press the |◁◁ button until the desired track appears in the DISPLAY.

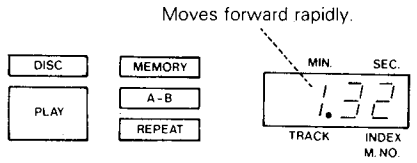


- When the DISC TRAY is open, the track number is set using the ▷▷| or |◁◁ buttons, and the operation will be carried out when the DISC TRAY is closed using the PLAY/PAUSE button.

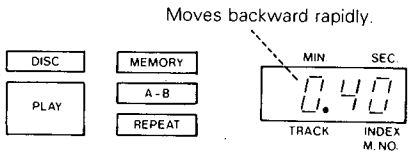
Audible Search

This feature can allows you to search either forward of backward to find a desired location. In addition, low volume audio can be heard.

1. To search forward, press and hold the ▷▷ button.



2. To search backward, press and hold the ◁◁ button.



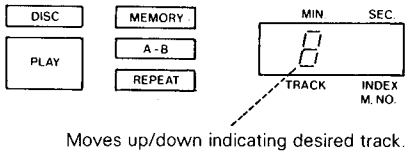
- Rapid, non-audible search, both fast-forward and backward, can be activated from pause mode.

Programming the Memory

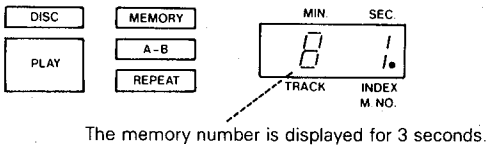
This feature allows you to select certain desirable programs, in any order, for playback, automatically skipping the rest. A maximum of 15 programs can be entered into the memory.

1. Pressing the PLAY/PAUSE button for more than 2 seconds changes the mode to the stop mode.

2. Press the ▷▷| or |◁◁ button until the desired track is displayed.



3. Press the MEMORY button.



The MEMORY indicator blinks for approx. 3 seconds when the memory is being registered.

4. Repeat steps 2 and 3.

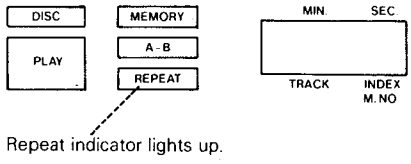
A maximum of 15 tracks can be entered into the memory.
(Full is displayed when a 16th entry is attempted.)

5. Press the PLAY/PAUSE button to begin memory playback.

- When clearing the memory, press the MEMORY CLEAR button.
- If the ▷▷| or |◁◁ button are pressed during memory playback, only those tracks registered in the memory will be skipped. The contents of the memory may be verified by doing this while in the pause mode.

Repeat Playback

This feature allows you to repeat all tracks on the disc, or the programs selected in memory. To activate, press the REPEAT button.



Repeat indicator lights up.

To release repeat function, press the REPEAT button again.

Repeat One Section of the Disc

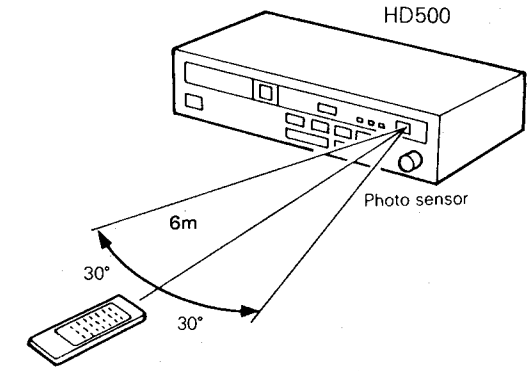
1. During playback, press the A—B REPEAT button at the beginning of the desired section. The A—B indicator blinks, and the starting point for repeat playback is set.
2. Press the A—B REPEAT button again during playback at the end of the desired section. The A—B indicator will remain lit, and the end point for repeated playback is set. The set section will be repeated continuously.
3. To discontinue an A—B repeat, press the REPEAT button.

Timer Playback

When the disc is set and the power is turned on, playback will begin automatically. In this way, operation of this unit together with a timer allows playback to begin automatically from a desired time.

Operational Range of Remote Control Unit

Use the remote control unit within the range shown in the diagram below.

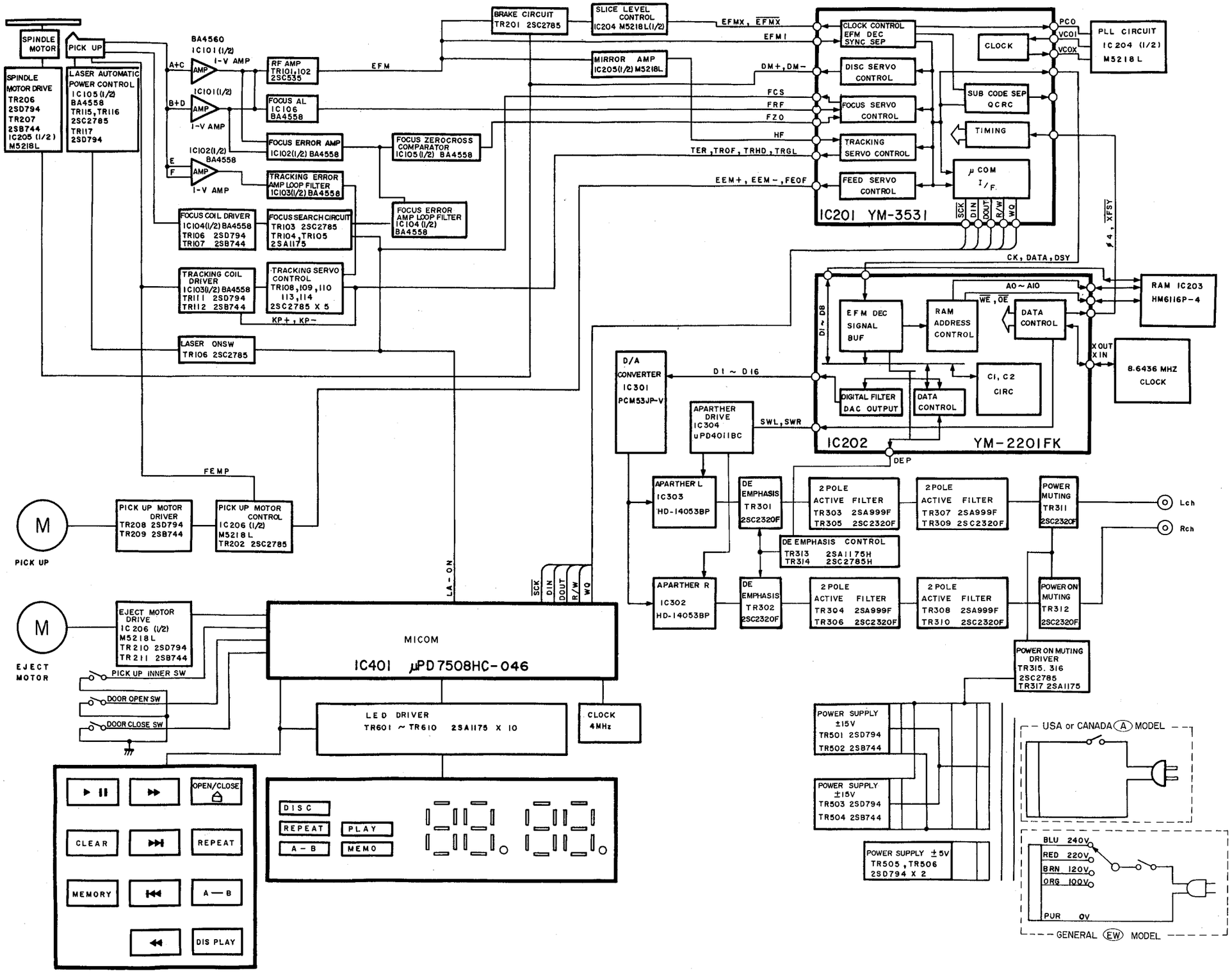


TROUBLESHOOTING CHECKLIST

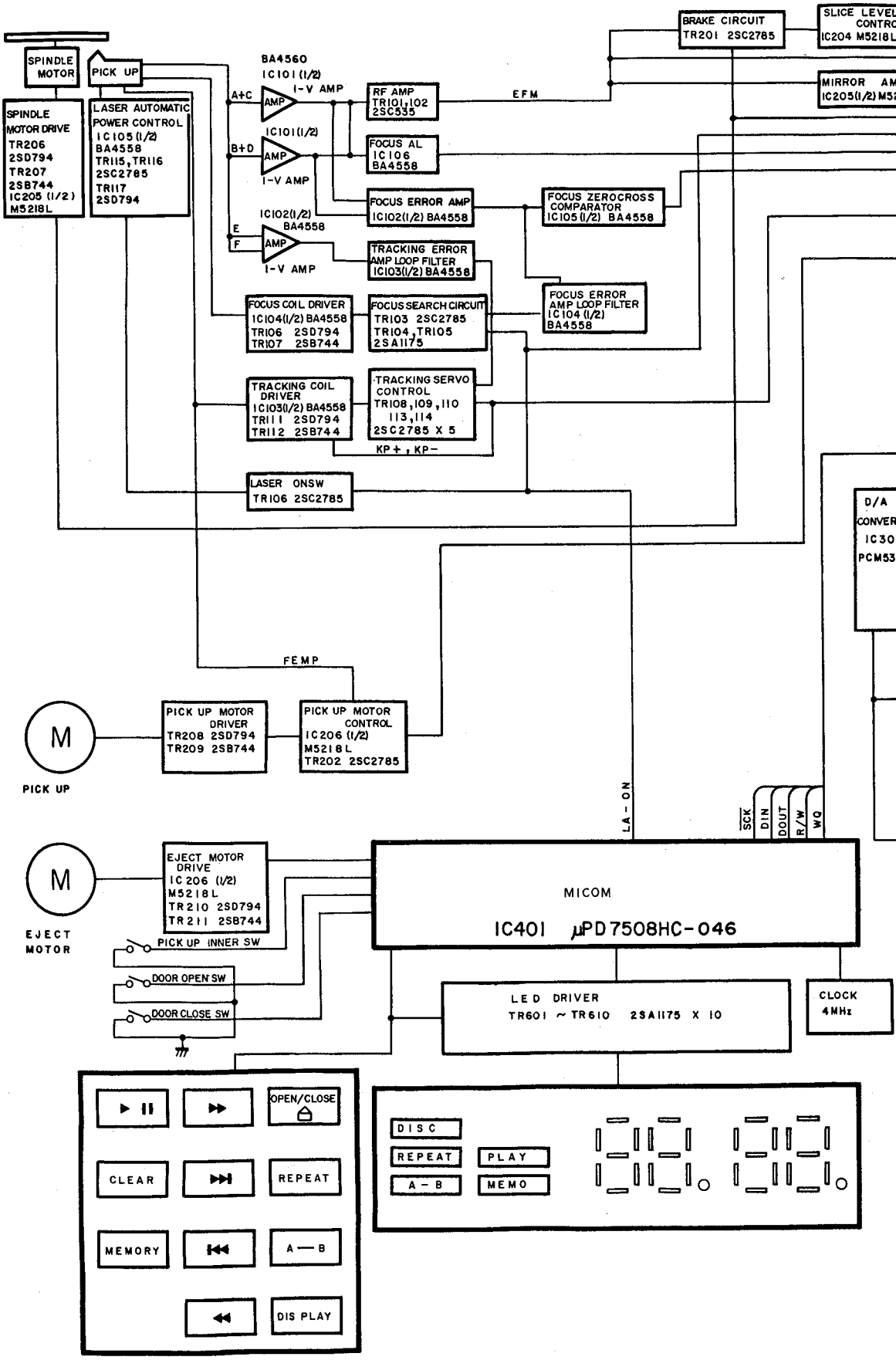
Check items listed below before requesting repair service. This may prove time saving in the long run.

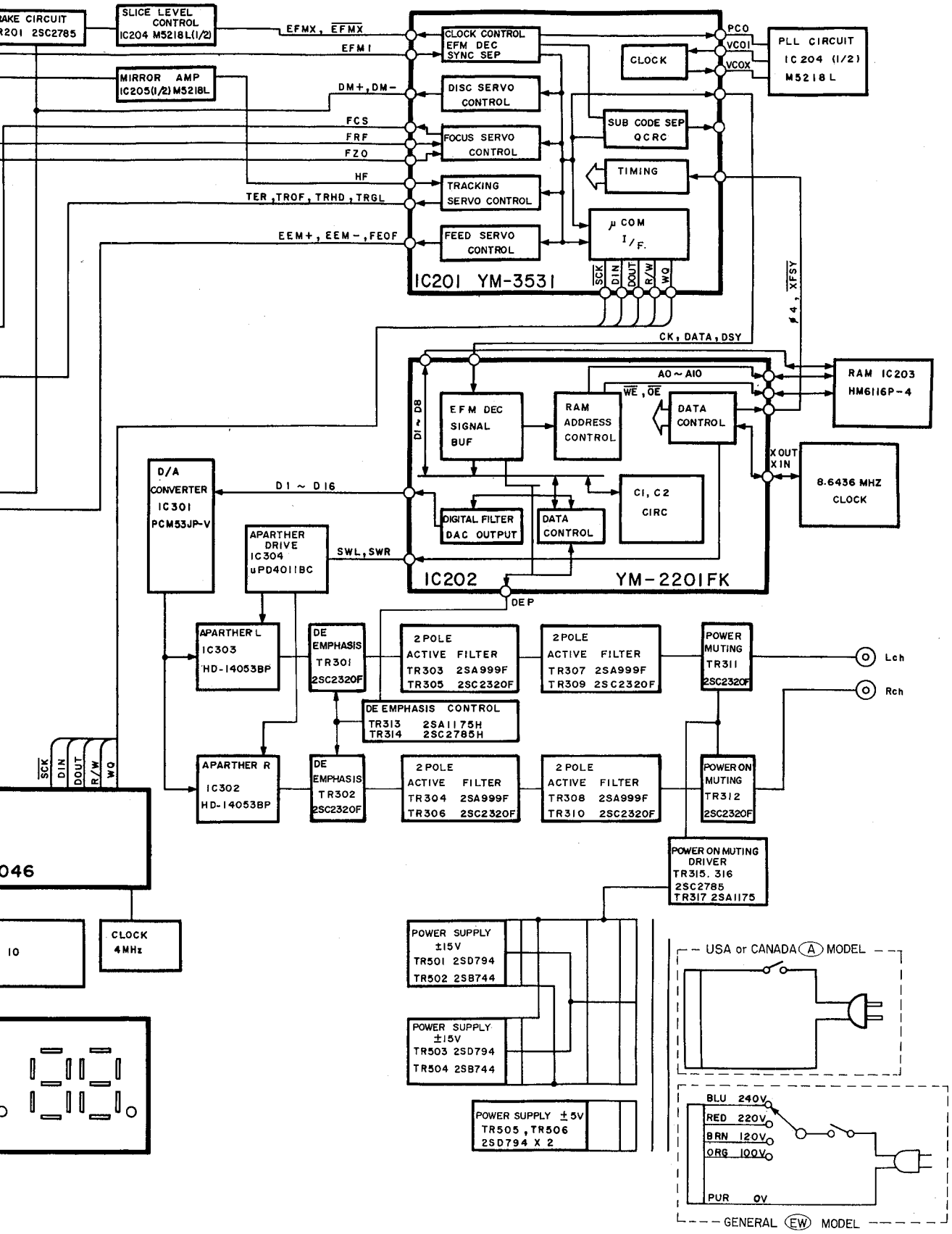
Problem	Cause	Remedy
The unit will not play although the disc has been loaded.	• The disc has been loaded upside down. • The disc is dirty. • The disc is scratched. • The disc is excessively warped. • Condensation has formed on the disc or optical head. • The disc does not conform to the appropriate standards.	• Reinsert the disc. • Clean the disc. • Replace the disc with a new one. • Replace the disc with a new one. • Wait for 20—30 minutes before operating the unit. • Use a different disc.
Certain portions of the disc do not play.	• The disc is dirty. • The disc is scratched.	• Clean the disc. • Skip over the scratched portion during playback.
The sound is distorted.	• Check the amplifier and CD player connections.	• Connect the amplifier and player together correctly.
Nothing happens when function keys are pressed. The display has characters that are neither numbers or letters.		• Turn the power off and then back on again.

BLOCK DIAGRAM



BLOCK DIAGRAM




SLICE LEVEL CONTROL IC204 M5218L(1/2)
EFMX, EFMX
EFMI
MIRROR AMP IC205(1/2) M5218L
DM+, DM-
FCS
FRF
FZO
HF
TER, TROF, TRHD, TRGL
EEM+, EEM-, FEOF
CLOCK CONTROL EFM DEC SYNC SEP
DISC SERVO CONTROL
FOCUS SERVO CONTROL
TRACKING SERVO CONTROL
FEED SERVO CONTROL
CLOCK
SUB CODE SEP QCRC
TIMING
μ COM I/F.
PCO
VCOI
VCOX
PLL CIRCUIT IC 204 (1/2) M5218L
SCK
DIN
DOUT
R/W
WQ
IC201 YM-3531
CK, DATA, DSY
XFSY
AO ~ A10
WE, OE
RAM IC203 HM6116P-4
DI ~ D8
EFM DEC SIGNAL BUF
RAM ADDRESS CONTROL
DATA CONTROL
X OUT
X IN
8.6436 MHZ CLOCK
D/A CONVERTER IC301 PCM53JP-V
D1 ~ D16
C1, C2 CIRC
DIGITAL FILTER DAC OUTPUT
DATA CONTROL
APARTHER DRIVE IC304 uPD4011BC
SWL, SWR
IC202 YM-2201FK
DEP
APARTHER L IC303 HD-14053BP
DE EMPHASIS TR301 2SC2320F
2POLE ACTIVE FILTER TR303 2SA999F TR305 2SC2320F
2POLE ACTIVE FILTER TR307 2SA999F TR309 2SC2320F
POWER MUTING TR311 2SC2320F
Lch
Rch
DE EMPHASIS CONTROL TR313 2SA1175H TR314 2SC2785H
APARTHER R IC302 HD-14053BP
DE EMPHASIS TR302 2SC2320F
2POLE ACTIVE FILTER TR304 2SA999F TR306 2SC2320F
2POLE ACTIVE FILTER TR308 2SA999F TR310 2SC2320F
POWER ON MUTING TR312 2SC2320F
POWER ON MUTING DRIVER TR315, 316 2SC2785 TR317 2SA1175
CLOCK 4MHz
POWER SUPPLY ±15V TR501 2SD794 TR502 2SB744
POWER SUPPLY ±15V TR503 2SD794 TR504 2SB744
POWER SUPPLY ±5V TR505, TR506 2SD794 X 2
USA or CANADA (A) MODEL
BLU 240V
RED 220V
BRN 120V
ORG 100V
PUR 0V
GENERAL (EW) MODEL

REMOVING THE CABINET

1. **Removal of Cover** (Figure 1)
   Remove screws (A), then lift and remove the cabinet as shown in Figure 1.

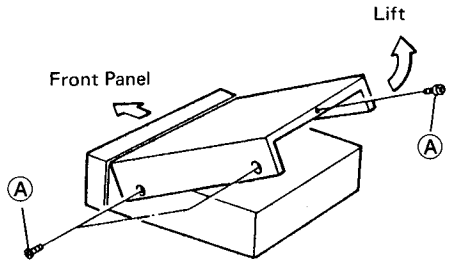


Figure 1

2. **Removal of Servo PCB Assembly**
   The servo PCB rises when the bottom panel (seven screws) and the two (B) screws are removed. (Figures 2 and 3)
   Remove the PCB supports and connectors (P101, P102, P103, W202, and W203) to allow for removal of the servo PWB assembly.

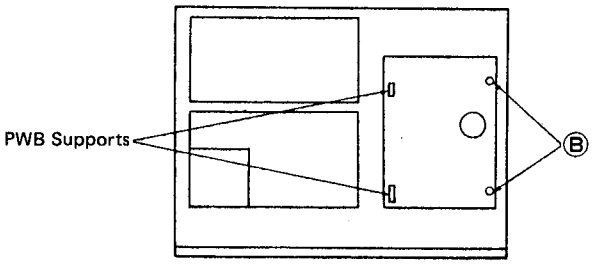


Figure 2

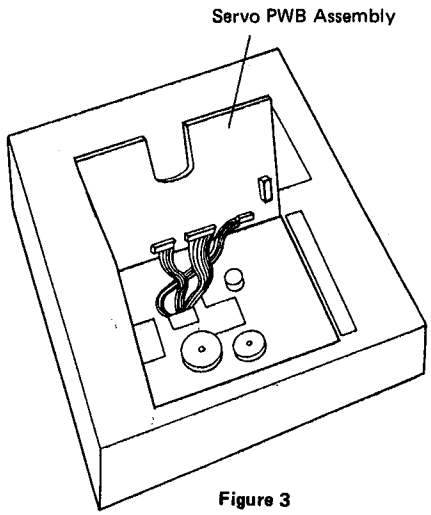


Figure 3
As Seen From Below

3. **Removal of Front Panel**
   Open the disc holder and remove the ornament. (Figure 4)
   Remove the cover, the five screws fastening the front panel (two on top, 3 on buttom), then release the catches located on both sides of the chassis.

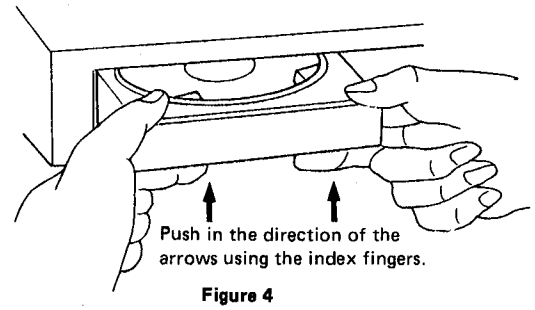


Figure 4

4. **Removal of Front PCB Assembly**
   Remove the front panel, connectors P401 and P402, the three screws (C), and catches (D). (Figure 5)

5. **Removal of Main PCB Assembly**
   Remove the cover and the five (E) screws and (G) screws holding the output jack (Figure 5).

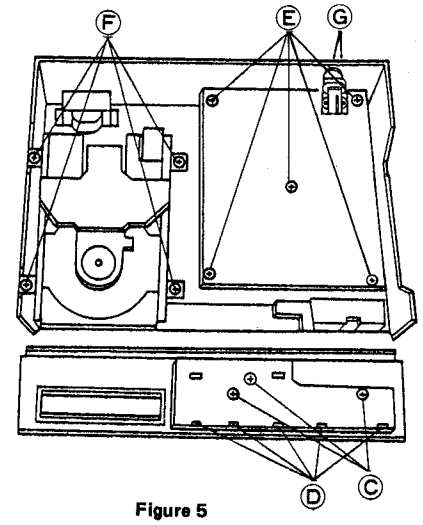


Figure 5

6. **Removal of Mechanism Unit**
   Remove the cover, the four (F) screws, and the P201 – P204 connectors on the main PCB assembly.

DISASSEMBLING THE MECHANISM UNIT

1. **Removal of Optical Pickup (Be sure to read 1—4 before replacement)**
   (1-1) Remove the optical pickup located on the servo PCB assembly, as well as the P101, P102, and P103 connectors. (Refer to page 11 for procedure for cabinet removal)
   (1-2) Remove the six (H) screws fastening the clamper, the spring, and finally the clamper. (Figure 6)

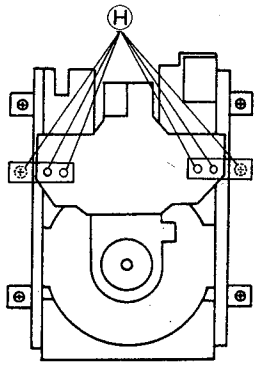


Figure 6

(1-3) Pull out the table then remove the (K) screw, allowing for removal of the optical pickup rail by rail. (Figure 7)

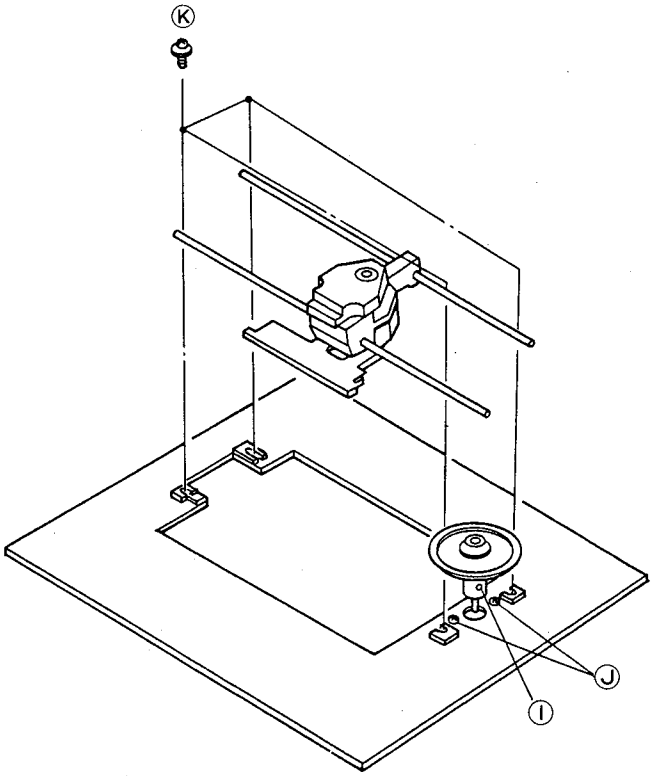
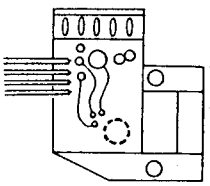


Figure 7

(1-4) Caution When Replacing
The optical pickups which are held in stock at parts centers are short-circuited and soldered.
(1) Connect the connectors (P101, P102, P103) to the servo PCB assembly.
(2) Check that the there is no leak in the soldering iron before removing the soldering. (Voltage below 10mV.)

If the leak voltage of the soldering iron is not known, short-circuit servo PCB TP109 and TP110 then remove the soldered portion of the optical pickup.



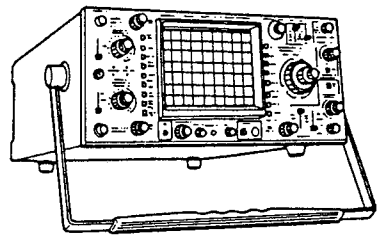
NOTE:
The ◌ portion of the Optical pickups available at your parts center is short-circuited and soldered.

Figure 8

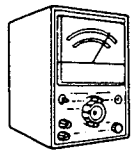
2. **Removal of Spindle Motor (Figure 7)**
   (2-1) Perform instructions (1-1) and (1-2) for removal of the optical pickup.
   (2-2) Use a 2.0mm hexagonal wrench to loosen the special screw (I) and remove the turntable.
   (2-3) Remove the two (J) screws to allow for removal of the spindle motor.
   (Use the turntable base spacer jig to set to the height of the turntable upon assembly.)

ADJUSTMENT PROCEDURE

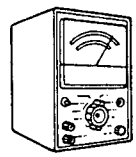
1. Meters and Jigs



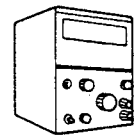
Oscilloscope (3 or more Modes, 100MHz, X–Y Input Possible)



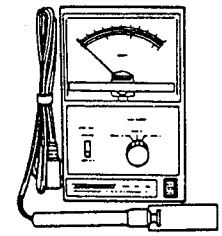
Voltmeter



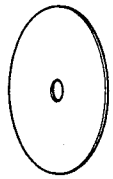
Distortion Meter



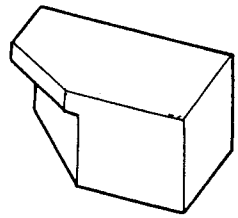
Frequency Counter



Optical Power Meter



Test Discs
- Philips Test Sample 5 814 125-2 (Non-Scratched)
- Philips Test Sample 5A 814 126-2 (Scratched)
- Sony Type III



Turntable Base Spacer Jig
18533451

2. Adjustment Points

2-1 VR and TP Layout for Servo PCB Adjustment

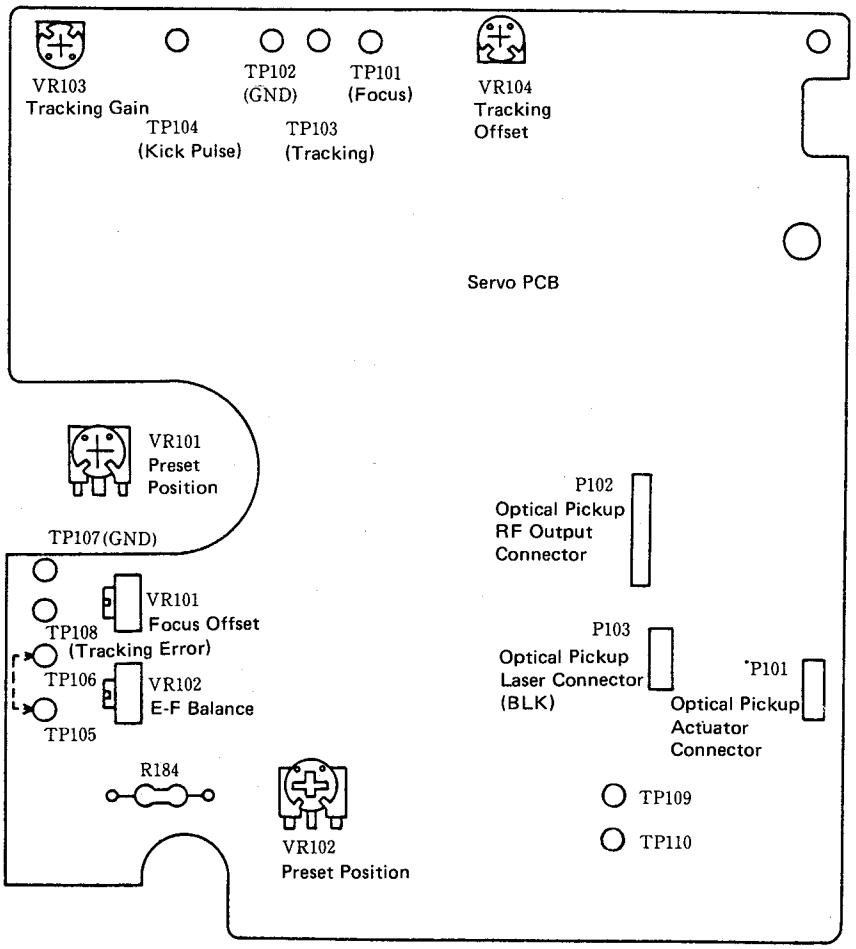


Figure 9

NOTE: The above VR directions are for the preset mode.

2-2 Coil and TP Layout for Main PCB Adjustment

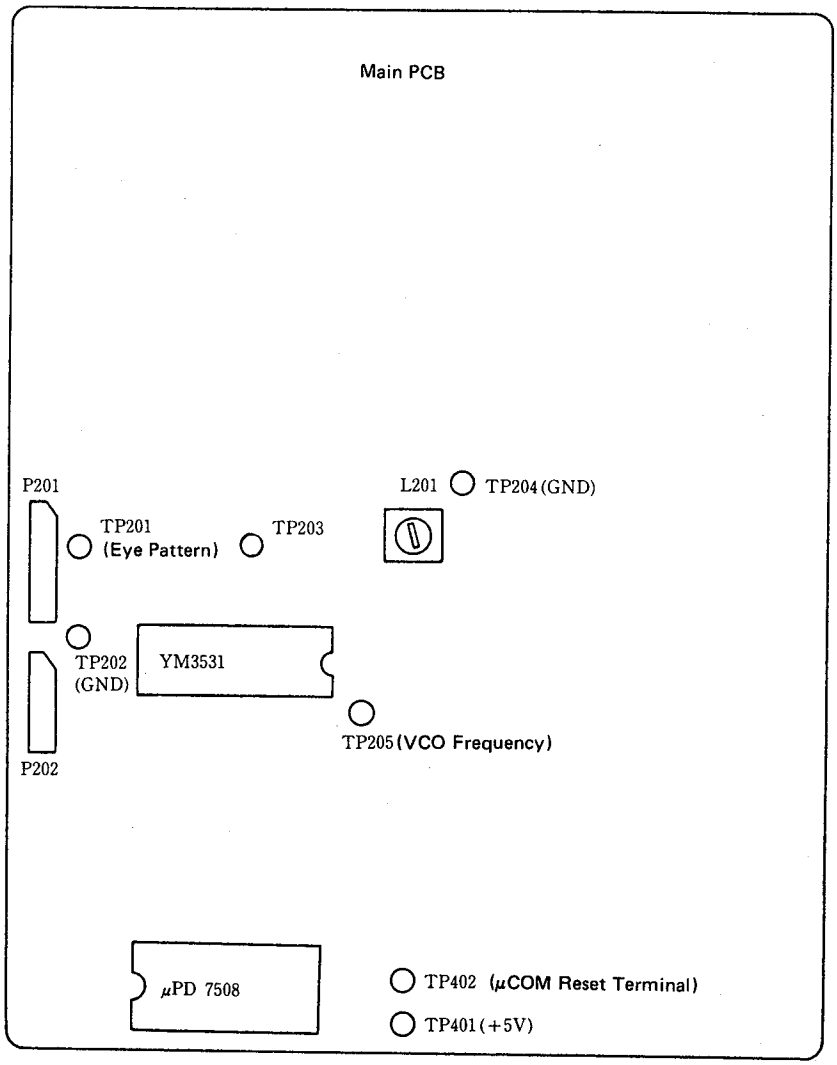


Figure 10

3. Optical Pickup Laser Power Check

(1) Short-circuit TP105 and TP106 located on the servo PWB.
(2) Remove the cabinet, place the optical power meter against the pickup, and check that the power is between 0.15mW and 0.4mW.

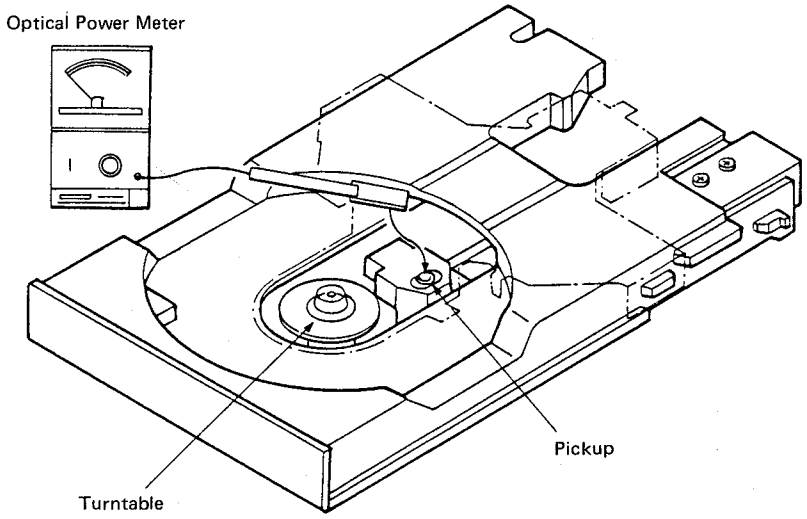


Figure 11

4. Adjustment of Main PWB

4-1 VCO Frequency Adjustment (Set is No signal).
(1) Connect the frequency counter to TP205 (CLK) and TP204. (Figure 12)
(2) Remove wire connector W201, turn the power switch on, and short-circuit TP201 and TP202.
(3) Rotate the L201 core and adjust so that the frequency counter shows a value of 4.322MHz ± 0.005MHz.
(4) After adjusting, turn the power off and connect the W201 wire connector.

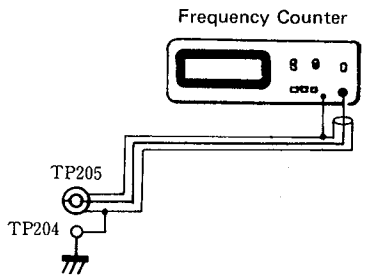
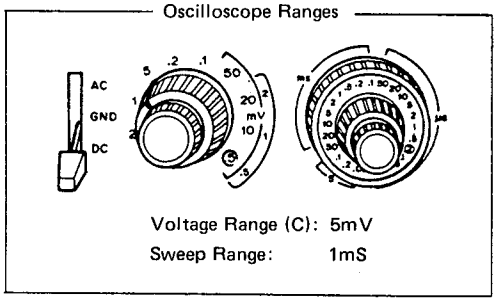


Figure 12

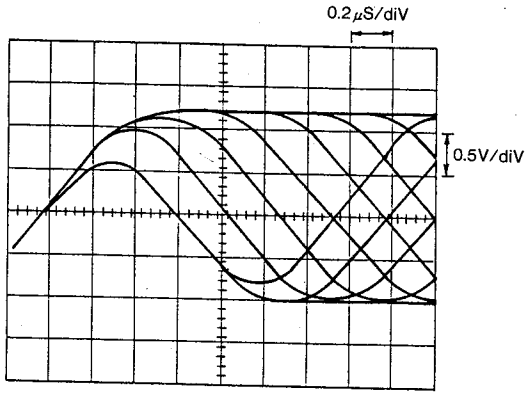
5. Adjustment of Servo PWB

5-1 Setting of Initial Volume
Before adjusting, preset all semi-fixed resistors.
Mechanically center VR101, 102, 103, 104 . . . .

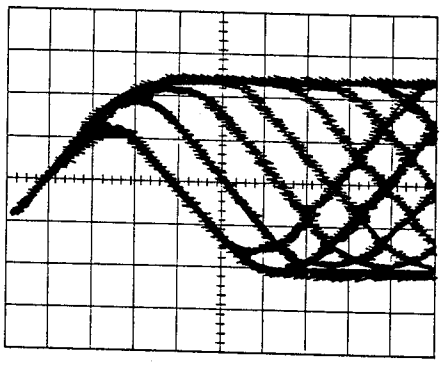
5-2 Tracking Offset Adjustment
(1) Rotate VR103 clockwise.
(2) Connect TP105 and TP106, and without inserting a disc adjust VR104 so that the voltage of TP103 (tracking coil output) and TP102 (GND) is of 0 ± 5mV.
(3) Disconnect TP105 and TP106, then preset VR103 to the mechanical center.



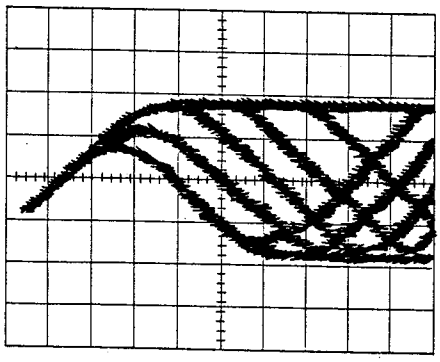
5-3 Focus Offset Adjustment:
with power switch off and no disc.
(1) Check that the optical pickup connector P103 is properly connected.
(2) Short-circuit TP109 and TP110, and remove the short-circuited portion of the optical pickup using a soldering iron. (Take sufficient measures against static electricity)
(3) Connect the voltmeter to both ends of R194 (50Ω).
(4) Connect TP105 and TP106 together. (Laser On)
(5) Turn the power switch on compute a current from voltage on both ends of R184, and check that the difference compared to the optical pickup indication (figure 14) is within +10mA for the + side and -10mA for the - side. Next turn the power switch off and disconnect the voltmeter.
(6) Turn the power back on, set the Philips Test Sample 4 test disc, and observe the TP201 output waveform (eye pattern).
(7) Adjust VR101 so that the eye pattern level becomes high and the waveform becomes distinct (so that the lines do are not thick). (Figure 13)



Focus Offset VR Adjustment



Focus Offset VR at Maximum
(Level is high but waveform is unclear)



Focus Offset VR at Minimum
(Level is low and waveform is unclear)

Figure 13 Focus Offset VR Eye Pattern Waveforms

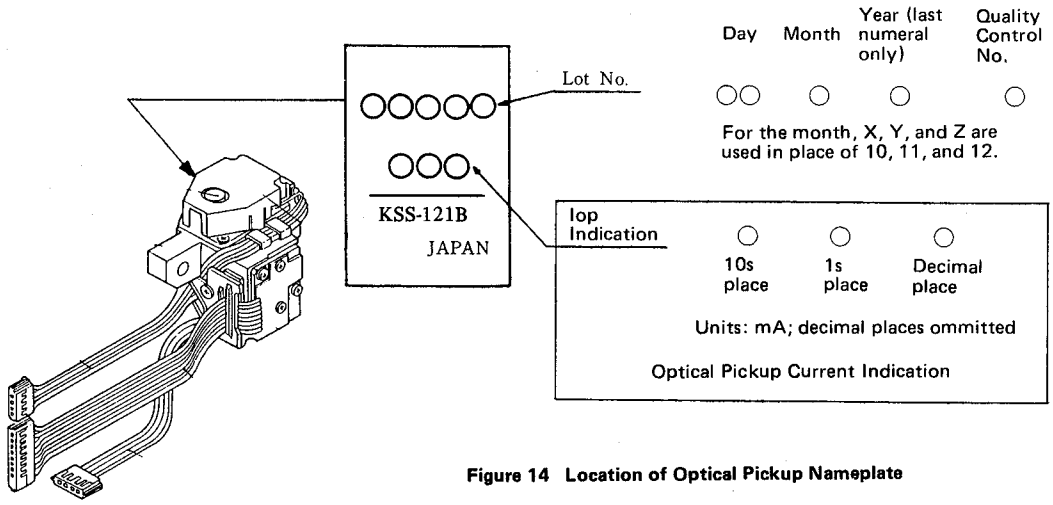


Figure 14 Location of Optical Pickup Nameplate

5-4 E-F Balance Adjustment (Supplementary Beam Balance Adjustment)

(1) Turn the power off and connect TP105 and TP106.

(2) Connect the oscilloscope between TP201 (eye pattern output) and TP202 (GND), and also between TP108 Tracking error and TP107 (GND).

(3) Turn the power switch, insert the Philips Test Sample 5 test disc and playback from the first selection. selection.

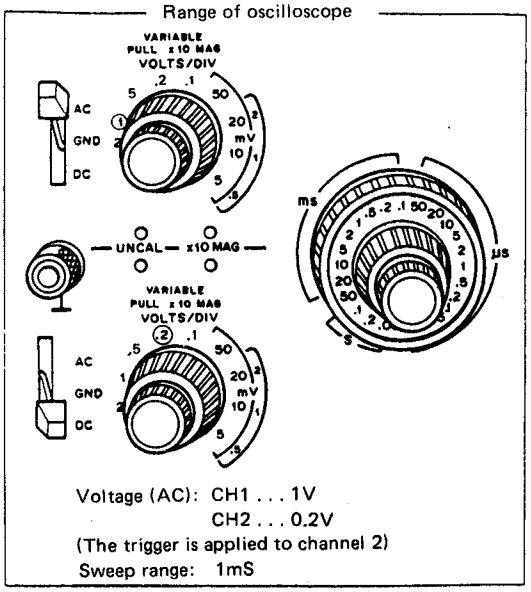
(4) Connect the main PWB TP402 (reset pin) and TP401 (+5V).
(As the microprocessor is in the Reset mode, the LED does not light)

(5) Rotate VR103 (tracking VR) clockwise.

a) Oscilloscope Ranges
b) Voltage Range (AC): CH1 . . . . 1V
CH2 . . . . 0.2V
c) (Set trigger on CH2)
d) Sweep Range: 1mS

(6) Observe the tracking error waveforms (Figure 15) and adjust VR102 so that the GND line is positioned at exactly half the waveform P-P value.

(7) Turn the power switch off, disconnect the oscilloscope, TP401 and TP402, and set VR103 to the mechanical center.



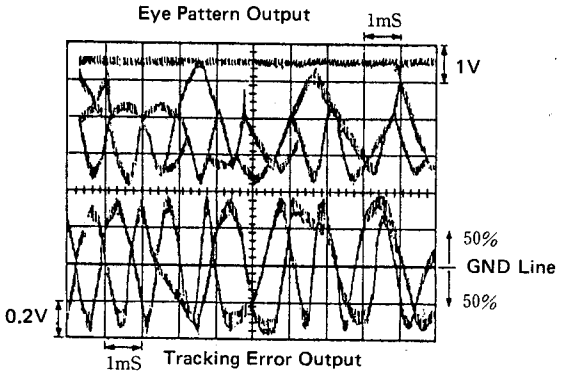


Figure 15

5-5 Tracking Gain Adjustment

(1) Insert the Philips Test Sample 4 test disc (non-scratched), observe the noise voltage on the voltmeter, and adjust VR103 so that the noise voltage on TP103 and TP102 is of 0.3V RMS ± 0.01V. (Figure 16)

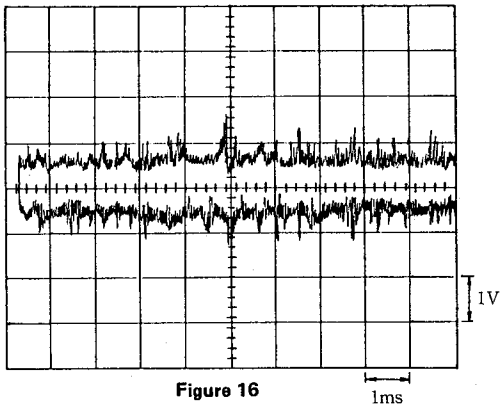


Figure 16

5-6 Kick Gain Adjustment

(1) Connect TP201 (eye pattern) and TP202 (GND) to CH1 on the oscilloscope, and TP104 (lens kick pulse) and TP102 (GND) to CH2.

(2) Insert the Philips Test Sample 4 test disc and check the size of the TP201 (eye pattern) output waveform. (Figure 17)

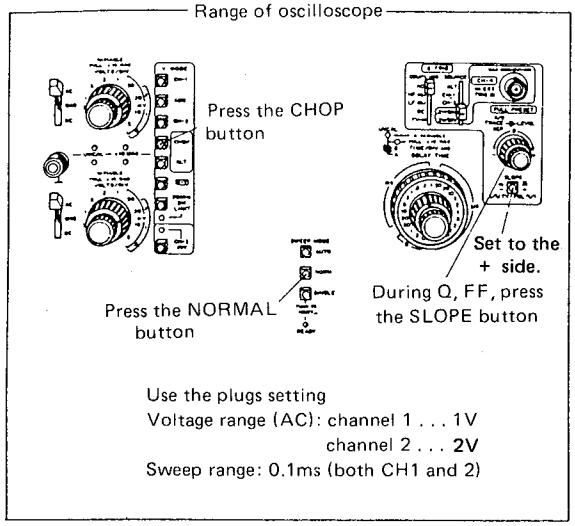
(3) Pause at selection 10 on the Philips Test Sample 4 test disc.

Oscilloscope Range:

Voltage Range (AC): CH1 . . . 1V
CH2 . . . 2V

Sweep Range: 0.2mS

Set a trigger on the leading edge of the TP104 waveform on CH2 (lens kick) and observe the TP201 waveform. (Figure 18)


Range of oscilloscope
Press the CHOP button
Set to the + side.
During Q, FF, press the SLOPE button
Press the NORMAL button
Use the plugs setting
Voltage range (AC): channel 1 . . . 1V
channel 2 . . . 2V
Sweep range: 0.1ms (both CH1 and 2)

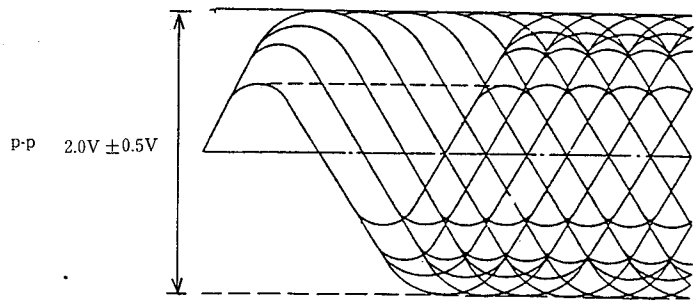
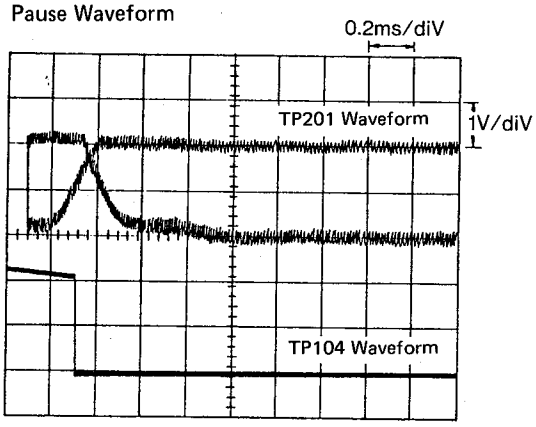
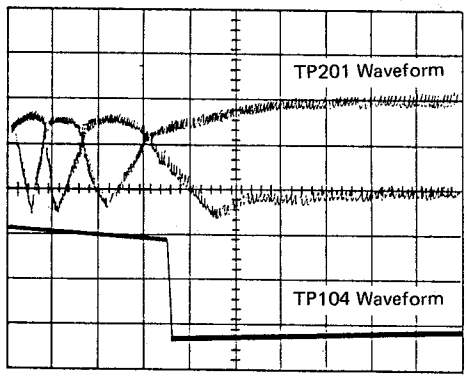


Figure 17 Eye Pattern

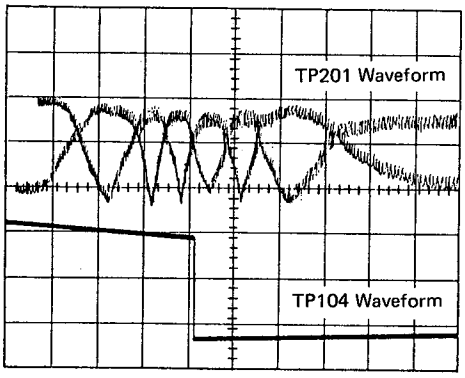
Pause Waveform



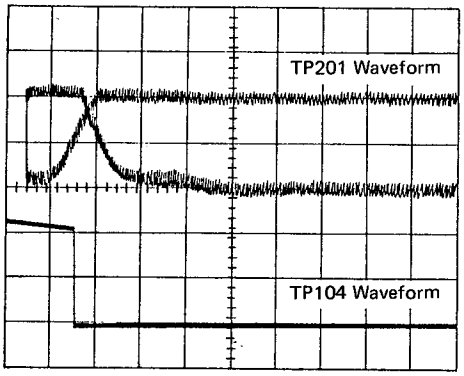
CUE Waveform



REV Waveform



REW Waveform



FF Waveform

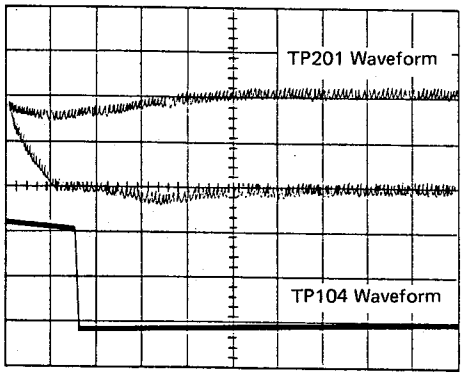


Figure 18 Eye Pattern Waveforms Upon Track Jump

6. Mechanism Unit Adjustment

6-1 Adjustment of Turntable Height (Figure 16)

(1) Loosen screw Ⓘ and insert the turntable base spacer.

(2) Rotate the turntable, check that there are no gaps or rattling, then tighten screw Ⓘ

(3) If there is no turntable base spacer, adjust to a height of 18.8mm.

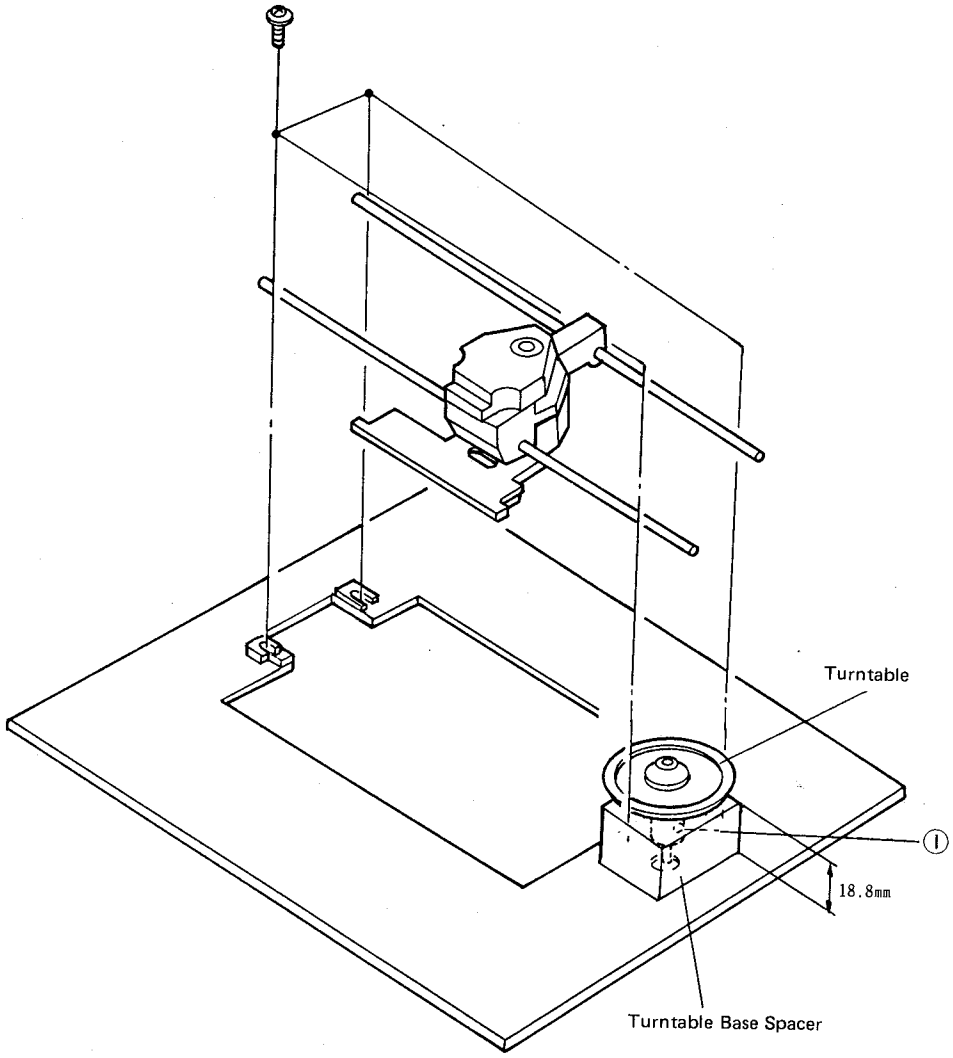


Figure 19

7. Operation Check

7-1 Playability

Use the Philips Test 5A (scratched) test disc, play the following portions and make sure no tracks are jumped.

(1) Wedge (Interruption)

700 μm Selection 8 0'00" – 0'30"

(2) Black Spot (Black Dot)

600 μm Selection 13 4'10" – Selection 14 0'30"

(3) Fingerprint

Selection 19 0'00" – 0'30"

6-2 Discs for Adjustments

	Adjustment	Disc	Check
1	Frequency Response	SONY TEST CD TYPE III	20Hz – 20kHz $^{+0.5}_{-0.7}$ dB
2	Distortion Rate	SONY TYPE III Selection 1	0.05% or below
3	S/N	SONY TYPE III Selection 1 PLAY/PAUSE	93dB or greater
4	Emphasis Response	SONY TYPE III Selection 39 – 41	(39) 1kHz –0.37dB ±0.5dB (40) 5kHz –4.53dB ±0.5dB (41) 16kHz –9.04dB ±0.5dB
5	Cross Talk	SONY TYPE III Selection 30 (L), Selection 34 (R)	75dB or greater

TROUBLE SHOOTING

1. Does not initialize

"E" (error) appears on display — YES →
- Door close switch defective

NO ↓

"DISC SET" display does not go off — YES →
- Pickup inner switch defective
- Check pickup slide mechanism (rack installation etc.)
- Check pickup FEED motor and circuit

NO ↓

Does disc rotate properly after disc holder is closed? — NO →
- Check spindle motor driving circuit
- Spindle motor defective
- Friction between disc and disc holder

YES ↓

Is pickup laser output normal? — NO →
- Check APC circuit
- Check pickup (laser current)

YES ↓

Is focus search waveform output from TP101? — NO →
- Check focus search circuit
- Check IC201 (12 pin)
- Pickup defective (laser)

YES ↓

Does pickup lens move vertically? — NO →
- Check pickup connector
- Pickup defective (actuator)

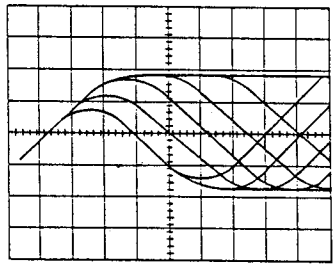
YES ↓

Do FRF and FZC become "active"? — NO →
- Check focus offset adjustment
- Check for improper turntable height
- Check RF pre-amp circuit
- Check pickup (photodiode)

YES ↓

Is eye pattern level normal? (2Vp-p ± 0.5V) — NO →
- Focus offset adjustment improper
- Pickup objective lens dirty
- Check RF pre-amp circuit, RF circuit

YES ↓



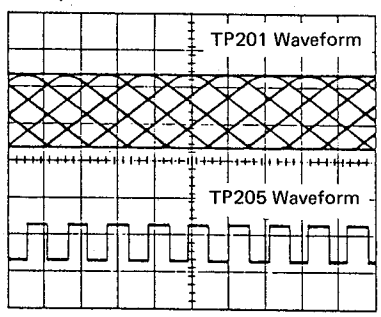
Eye Pattern

Is bit synchronization normal? —NO→
- PLL adjustment improper
- Friction between disc and disc holder

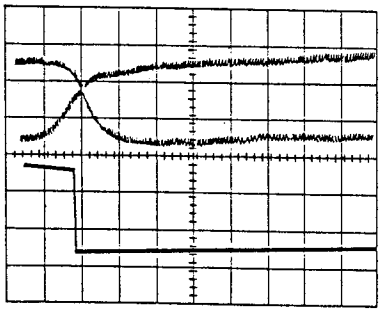
YES ↓

Is TP104 kick pulse waveform normal? —NO→
- Check tracking control circuit
- Check IC201 control pin

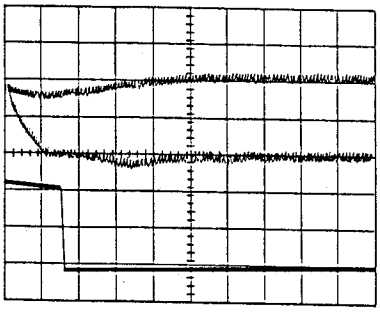
Bit Synchronization Waveform

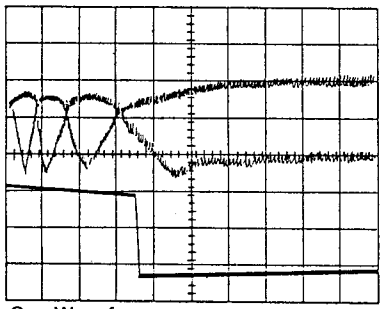


Pause Waveform

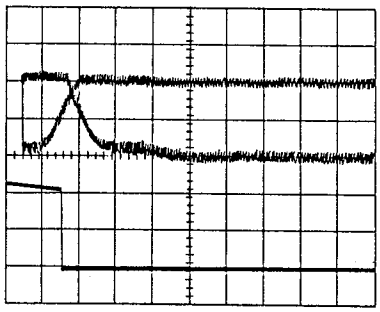


Rewind Waveform

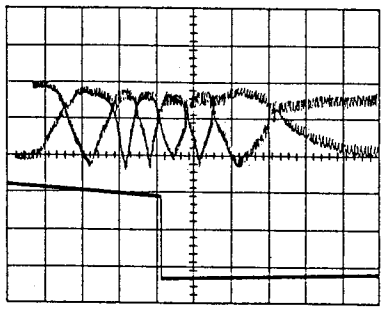




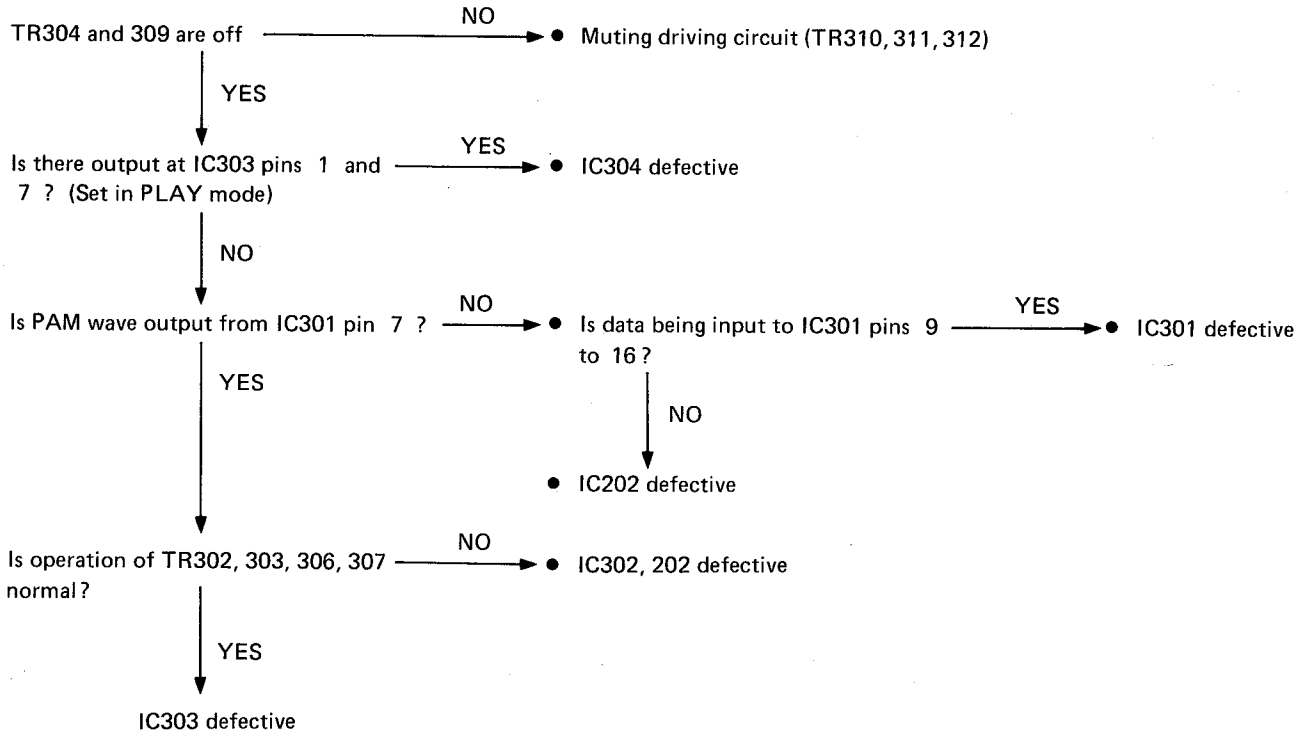
Cue Waveform

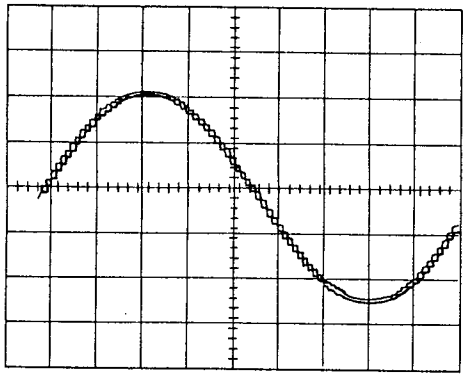


FF Waveform

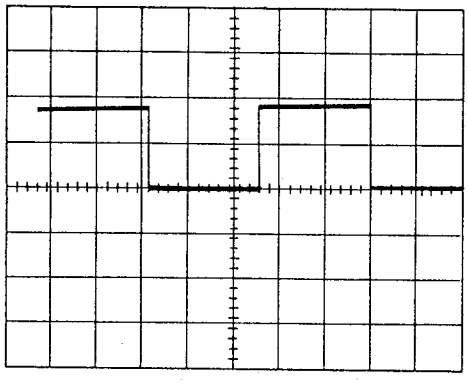


2. No sound is produced





PAM Waveform
(Test Disc: Sony Type III, 1st selection)



IC301 Pin 1 Waveform
(Test Disc: Sony Type III, 1st selection)

3. IC201 Terminal Functions

Terminal number	Terminal code	I/O	Outline of functions
1	VDD	I	+5V power supply terminal
2 3	VCOX VCOI	0 I	The LC resonance circuit is connected between these terminals. These terminals are used for the VCO clock oscillation (average 8.6436MHz).
4	PCO	0	This is the VCO clock control output terminal. This sets the VCO clock oscillation circuit so that the frequency increases when the average DC voltage between these terminals is high.
5 20	VCC VSS	I I	These are the grounding terminals.
6 7	EFMX $\overline{\text{EFMX}}$	0 0	Connect to the EFM signal slice level control circuit. This is the amplification-limited EFM signal output terminal. 8 > 7. The gain of 7 > 6 is 15.
8	EFMI	I	Input the EFI signal (1 – 2VPP) into this terminal
9	SYEQ	0	This is the monitor output terminal that gives a "H" level signal when the synchronization signal of the EFM pattern and the synchronization signal of the internal counter correspond.
10 11	DM + DM -	0 0	These are the PWM output terminals, connected to the disc motor drive circuit. It is not possible for both terminals to register "H" simultaneously.
12	FCS	0	This is the focusing output terminal.
13	$\overline{\text{FZC}}$	I +	Based on the focus error signal, a "L" signal will be input when the focus point is reached.
14	FRF	I	A "H" signal will be entered into this terminal when reflected light is received.
15	HF	I	The EFM envelope signal (amplitude logic level) is entered into this terminal.
16	TER	I	The tracking error signal (amplitude logic level) is entered into this terminal.
17	$\overline{\text{TEST}}$	I +	This test terminal is to be grounded, and contains pull-up resistors.
34	TCL	I +	This test terminal is ungrounded, and contains pull-up resistors.
18	TROF	0	This is the output terminal that switches off the tracking signal of the tracking servo circuit.
19	TRGL	0	This output terminal minimizes the gain of the tracking servo circuit.
20	TRHD	0	This output terminal holds the tracking error signal of the tracking servo circuit while KP+ or KP- (see below) are being output.
22 23	KP + KP -	0 0	These output terminals are for the track kick function, and are connected to the tracking servo circuit.
24	FEOF	0	This output terminal is used to switch off the input signal of the feed servo circuit.
25 26	FEM + FEM -	0 0	These output terminals are for the high-speed feed function, and are connected to the feed servo circuit.
27	WQ	0	This request output terminal is connected to μCOM, and requests that data data be sent from SVC > μCOM.

Terminal number	Terminal code	I/O	Outline of functions
28	R/W	O	This output terminal is connected to μCOM, and is used for the switching of the data transmission mode. When R/W = "L", data is transmitted from SVC > μCOM, and when R/W = "H", data is transmitted from μCOM > SVC.
29	DOUT	O	This data output terminal is connected to μCOM. When R/W = "L", data can be transmitted from SVC > μCOM according to the SCK clock input.
30	DIN	I	This data input terminal is connected to μCOM. When R/W = "H", data is transmitted from μCOM > SVC according to the SC key clock input.
31	SCK	I	Connected to μCOM, this terminal is for the clock input, required for data transmission.
32	XFSY	I	This is the frame synchronization signal (7.35kHz) input terminal, connected to the SCG output.
33	φ4	I	This is the crystal clock (4.321MHz) input terminal, connected to the SGP output.
35	RCX	I +	Connected to μCOM, this terminal is for the clock input, required for the subcode transmission. It is disconnected when not being used.
36	VFSY	O	This is the VCO frame synchronization signal (average 7.35kHz) output terminal, connected to μCOM. Detecting the change from "H" > "L", this can be used as a request signal, requesting that the subcode be transmitted from SVC > μCOM.
37	SUB	O	This is the subcode output terminal, connected μCOM. The subcode can be transmitted from SVC > μCOM, according to the $\overline{RCK}$ clock input.
38	DSY	O	This is the synchronization signal output terminal for the serial signals (see below), connected to the SGP input.
39	DATA	O	This is the serial signal output terminal for the 8 bit EFM demodulation signals and the 5 bit control signals, connected to theSGP input.
40	CK	O	This is the VCO clock (average 4.3218MHz) output terminal, connected to the SGP input.

4. IC202 Terminal Functions

Terminal number	Terminal code	I/O	Outline of functions
1 17	VSS VSS	I I	These are the grounding terminals.
2 3 7 8	$\overline{\text{TEST 1}}$ $\overline{\text{TEST 2}}$ $\overline{\text{TEST 3}}$ $\overline{\text{TCL}}$	I + I + I + I +	These test terminals are ungrounded, and contain pull-up resistors.
4	CK	I	This is the VCO clock (average 4.3218MHz) input terminal, connected to the SVC output.
5	DATA	I	This is the serial signal input terminal for the 8 bit EFM demodulation signals and the 5 bit control signals, connected to the SVC output.
6	DSY	I	This is the synchronization signal input terminal for the serial signals (see above), connected to the SVC output.
9	ϕ4	O	This is the crystal clock (4.3218MHz) output terminal, connected to the SVC input.
10	$\overline{\text{XFSY}}$	I/O	This is the frame synchronization signals (7.35kHz) output terminal, connected to the SVC input. (During test operations, the synchronization can be resynchronized by setting this terminal to the "L level".)
11 12 13 14 15 16 18 19 20 21 24	A0 A1 A2 A3 A4 A5 A6 A7 A8 A9 A10	O O O O O O O O O O O	These are the address output terminals, connected to the RAM address terminals.
22	$\overline{\text{WE}}$	O	This is connected to the RAM WE terminal. When a "L level" signal is registered, the RAM will be set to the WRITE mode.
23	$\overline{\text{OE}}$	O	This is connected to the RAM OE terminal. When a "L level" signal is registered, the RAM will be set to the READ mode.
25 26 27 28 29 30 31 32	D8 D7 D6 D5 D4 D3 D2 D1	I/O I/O I/O I/O I/O I/O I/O I/O	These are connected to the RAM data terminals. The output mode is set when the cycle at the data input terminal is WE = "L", and the input mode is set when the cycle is WE = "H".
33	DEP	O	This is the output terminal for the audio frequency characteristics switching signals of the audio filter. The emphasis will be required when "H" is registered.

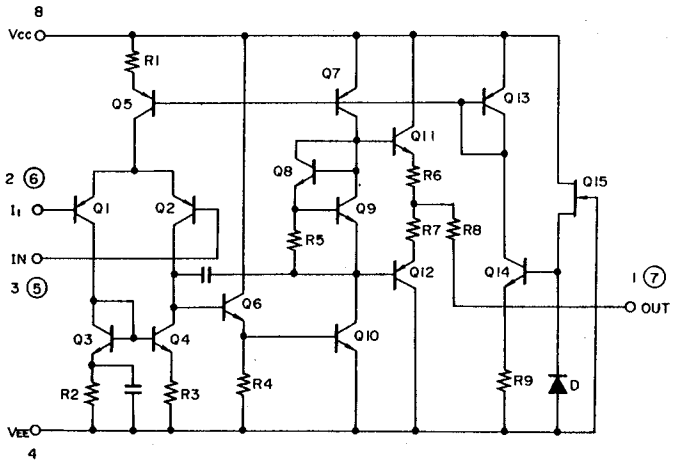
Terminal number	Terminal code	I/O	Outline of functions
34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50	$\overline{Q1}$ $\overline{Q2}$ $\overline{Q3}$ $\overline{Q4}$ $\overline{Q5}$ $\overline{Q6}$ $\overline{Q7}$ $\overline{Q8}$ $\overline{Q9}$ $\overline{Q10}$ $\overline{Q11}$ $\overline{Q12}$ $\overline{Q13}$ $\overline{Q14}$ $\overline{Q15}$ $\overline{Q16}$ Q16	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Connected to the DAC input, the parallel signals are output by way of the internal digital filter form these terminals. The output is in alternation from the left and right channels. The output rate for each channel is 88.2kHz. Connect either Q16 or ($\overline{Q16}$), according to the DAC to be used.
51	$\phi 2$	0	This is the crystal clock (2.1609MHz) output.
52	SDO	I/O	This is the serial signal output for the DAC. Using a $\phi 2$ clock beat rate, the signals are output from LSB in the order of L channel 24 bit – R channel 25 bit.
53	SDSY	0	This is the synchronization signal output for the above serial signals. The level is "H" for L channel and "L" for R channel.
56	TEST	I+	This test terminal contains pull-up resistors, and is normally disconnected. Using a "L" signal, it is also possible to input serial signals with the same format as the above serial signals from the SDO terminal into the digital filter.
54 55 57 58	C1F1 C1F2 C2F1 C2F2	0 0 0 0	This monitor output terminal depicts the C1 and C2 error correction operation mode.
59	R/L	0	This is the output terminal for the channel allocation signal of the DAC analog output. "H" is for the R channel, and "L" is for the L channel.
60 61	SWR SWL	0 0	This is the degliche signal for the respective channels of the DAC analog output.
62	VDD	I	This is the +5V power supply terminal.
63 64	XIN XOUT	I 0	A crystal oscillator is connected between these terminals, which are used for the crystal clock (8.6436MHz) oscillation.

5. IC401 Terminal Functions

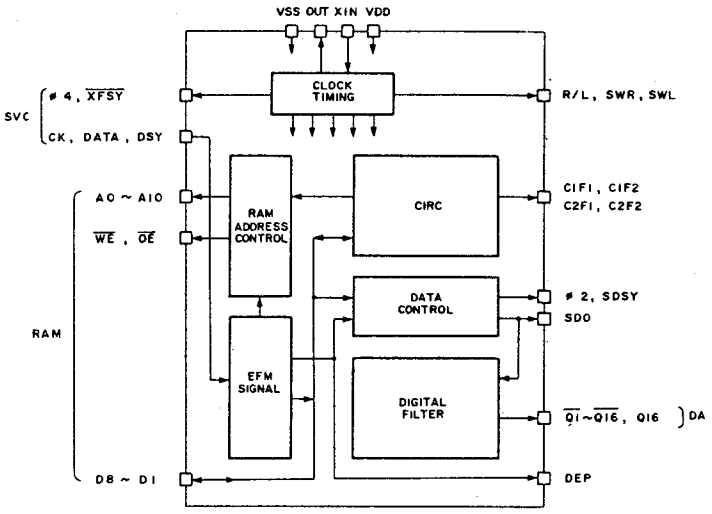
Terminal number	Terminal code	I/O	Outline of functions	Active Level
1	ϕ OUT	O	Internal clock output, open before use	H
2	$\overline{S0}$	O	7 segment display (a)	"L"
3	$\overline{S1}$	O	7 segment display (b)	"L"
4	$\overline{S2}$	O	7 segment display (c)	"L"
5	$\overline{S3}$	O	7 segment display (d)	"L"
6	$\overline{KEY0}$	I	Key matrix input	"L"
7	$\overline{KEY1}$	I	Key matrix input	"L"
8	$\overline{KEY2}$	I	Key matrix input	"L"
9	IR	I	Indicates reception of remote control data	"H"
10	$\overline{S4}$	O	7 segment display (e)	"L"
11	$\overline{S5}$	O	7 segment display (f)	"L"
12	$\overline{S6}$	O	7 segment display (g)	"L"
13	$\overline{S7}$	O	7 segment display (h) – dot point – DISC, MEMORY	"L"
14	$\overline{T0}$	O	Display dynamic scan (minutes 10s place)	"L"
15	$\overline{T1}$	O	Display dynamic scan (minutes 1s place)	"L"
16	$\overline{T2}$	O	Display dynamic scan (seconds 10s place)	"L"
17	$\overline{T3}$	O	Display dynamic scan (seconds is place)	"L"
18	RESET	I	Reset input	H
19	CL 1	I	Oscillator circuit input	H
20	V_{DD}	I	Power supply input	H
21	CL 2	O	Oscillator circuit output	H
22	INT 1	I	Interrupt input, connected to GND before use	
23	WQ	I	Time data read out demand	"H" Active
24	$\overline{SCK}$	O	Serial communications clock	"L" Pulse
25	SO	O	Command transmission line (7508 → 3531)	"H"
26	SI	I	Time data transmission line (3531 → 7508)	"H" Active
27	RD 0	I	Remote control data (parallel bit 1)	"H"
28	RD 1	I	Remote control data (parallel bit 3)	"H"
29	RD 2	I	Remote control data (parallel bit 3)	"H"
30	$\overline{R}$/W	O	Serial communications direction control (→ YM3531)	H (command) L (data)

Terminal number	Terminal code	I/O	Outline of functions	Active Level
31	$\overline{\text{D·CLS}}$	I	Disc tray closed position detection switch input	"L"
32	$\overline{\text{D·OPN}}$	I	Disc tray open position detection switch input	"L"
33	$\overline{\text{P·STA}}$	I	Pickup inner circumference position detection switch input	"L"
34	RD 3	I	Remote control data (parallel bit 4)	"H"
35	D·CSG	O	Disc tray closing direction driving output	"H"
36	D·OSG	O	Disc tray opening direction driving output	"H"
37	LA-ON	O	Pickup laser output signal	"H"
38	$\overline{\text{S 8}}$	O	Display output (i) REPEAT A ↔ B, REPEAT TIME SPACE PLAY/PAUSE	"L"
39	V_{SS}	I	GND pin	L
40	EVENT	I	Event input, connected to GND before use	H

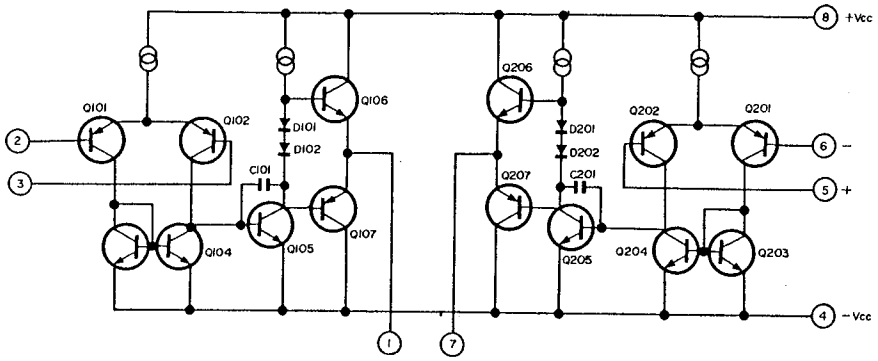
IC BLOCK DIAGRAM



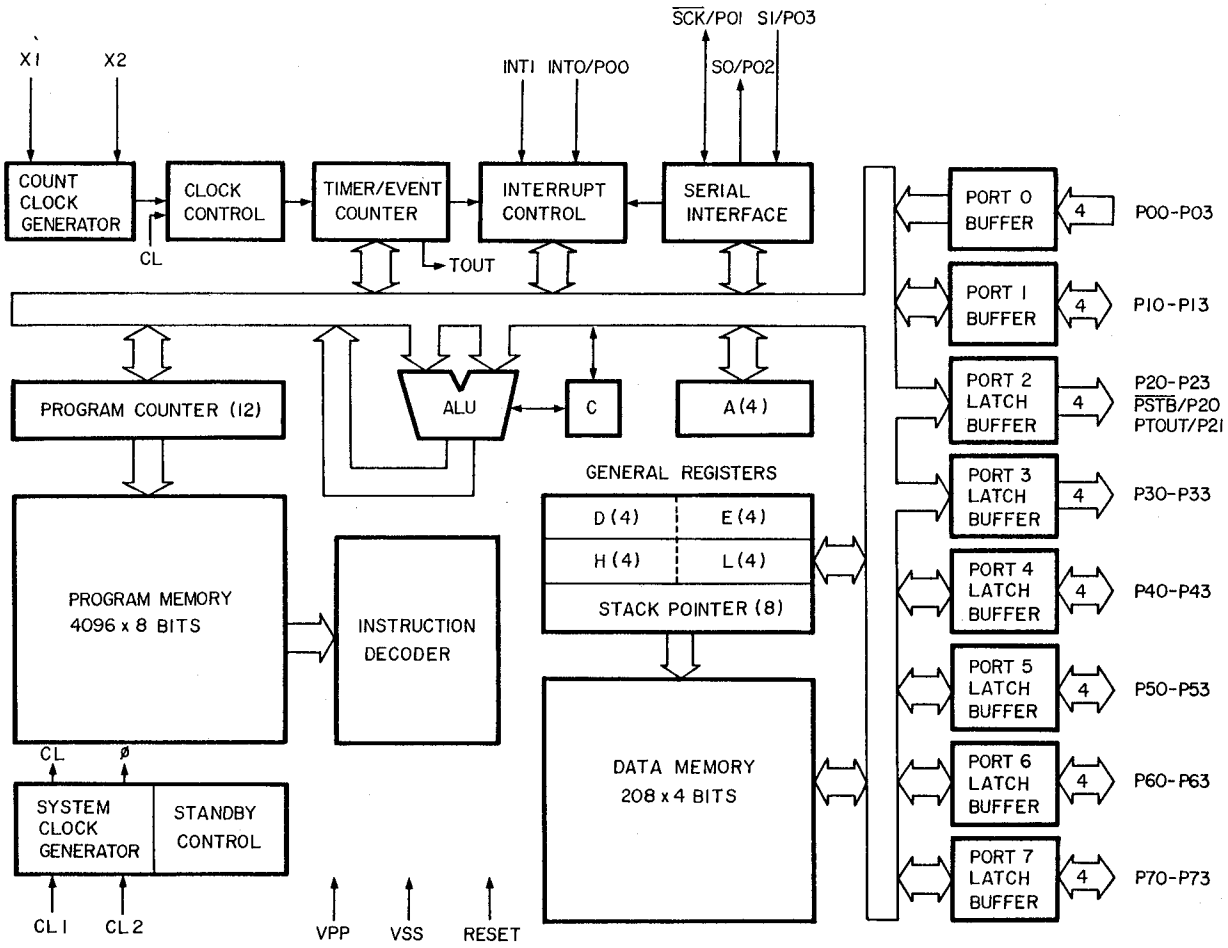
IC BA4558
IC102, 103, 104, 105, 106



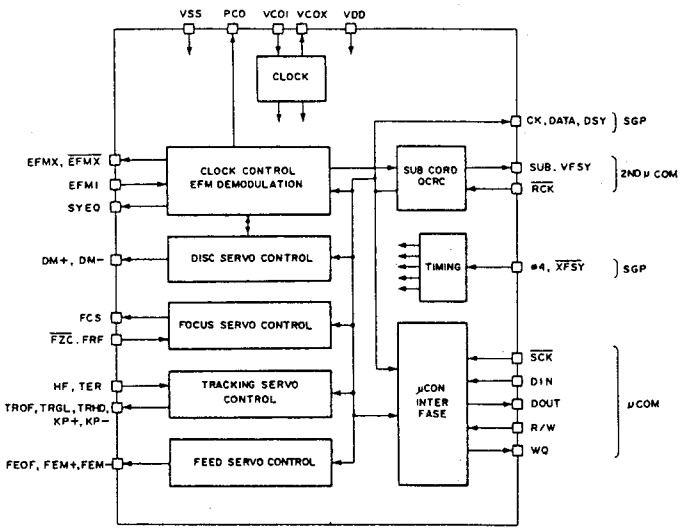
IC MOS YM-2201F
IC202



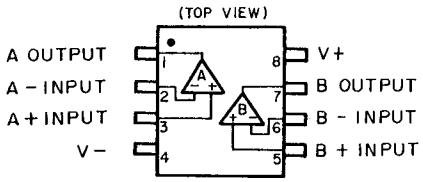
IC M5218L
IC 204, 205, 206, 701



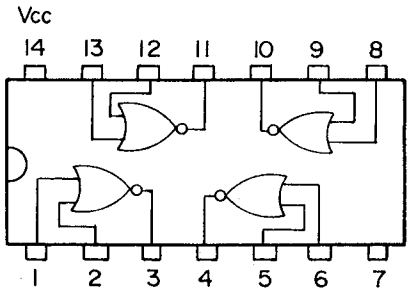
IC MOS μPD7508HC-046
IC401



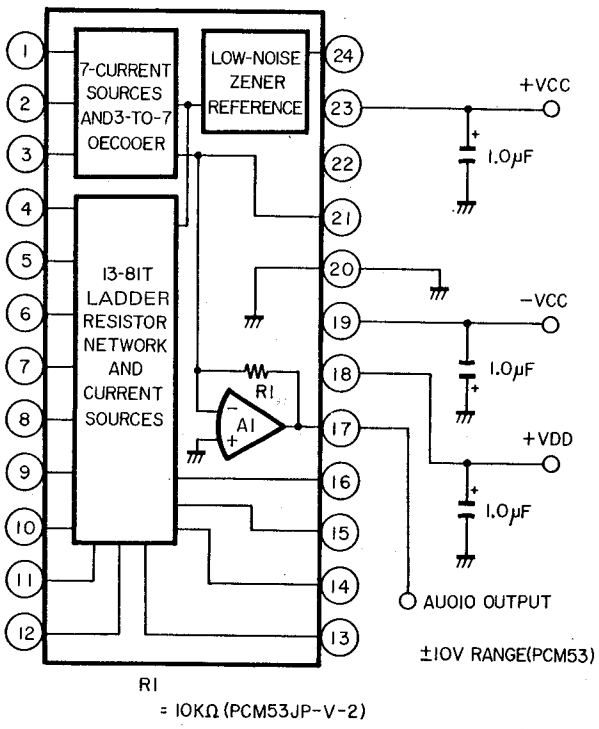
IC MOS YM3531
IC201



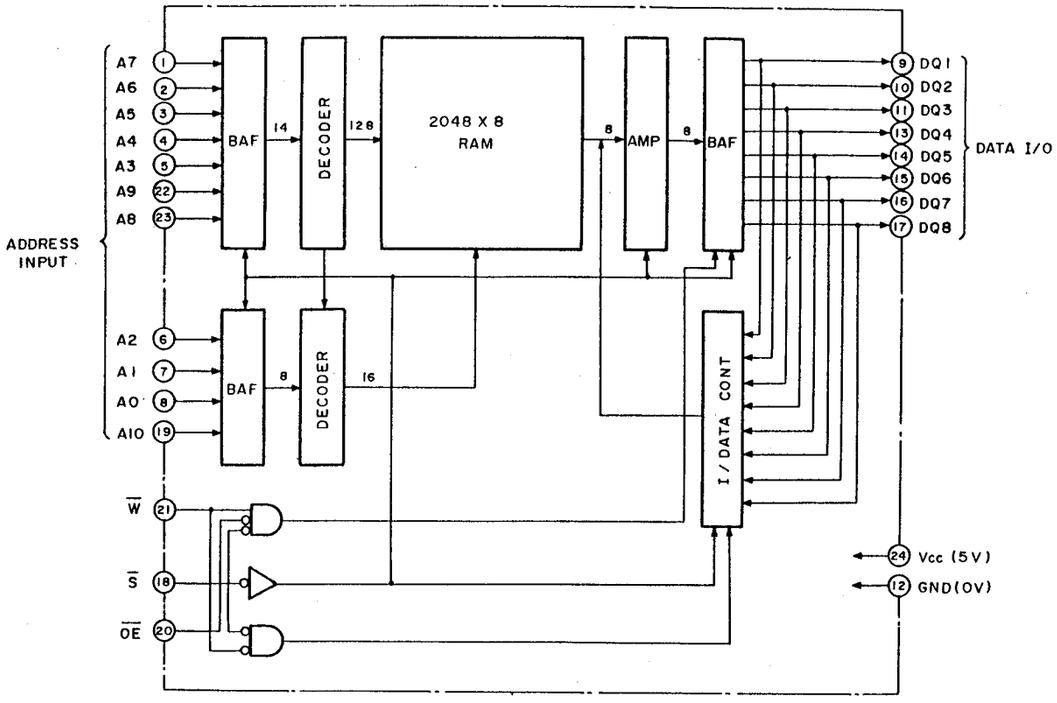
IC BA4560
IC101



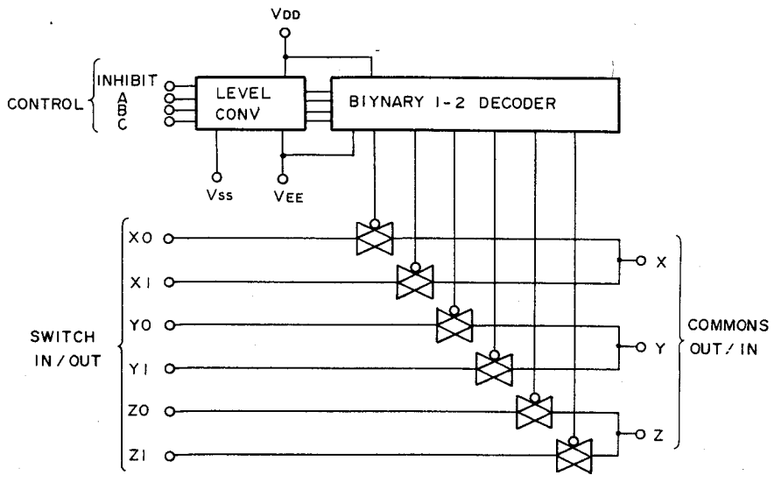
IC μPD4011BC
IC304



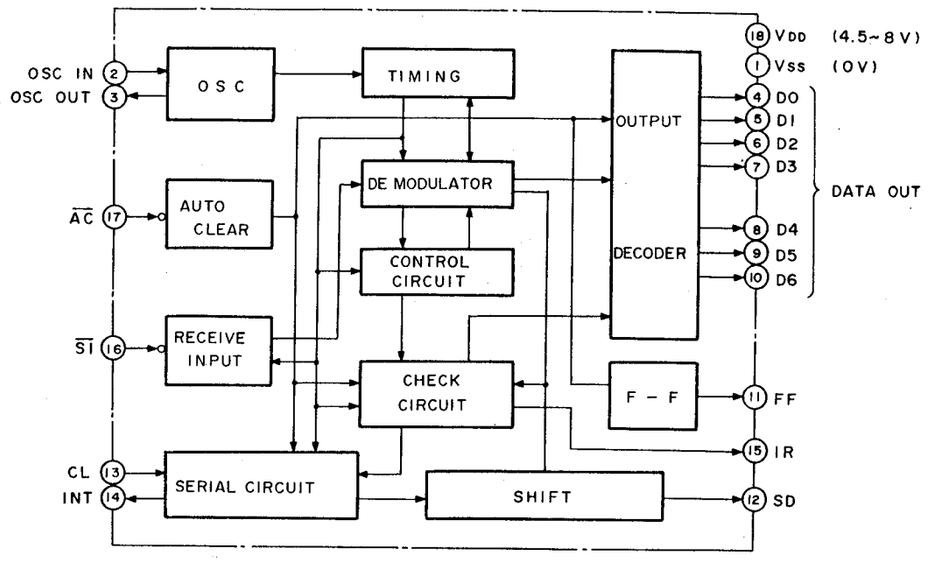
IC PCM53JPV-2
IC301



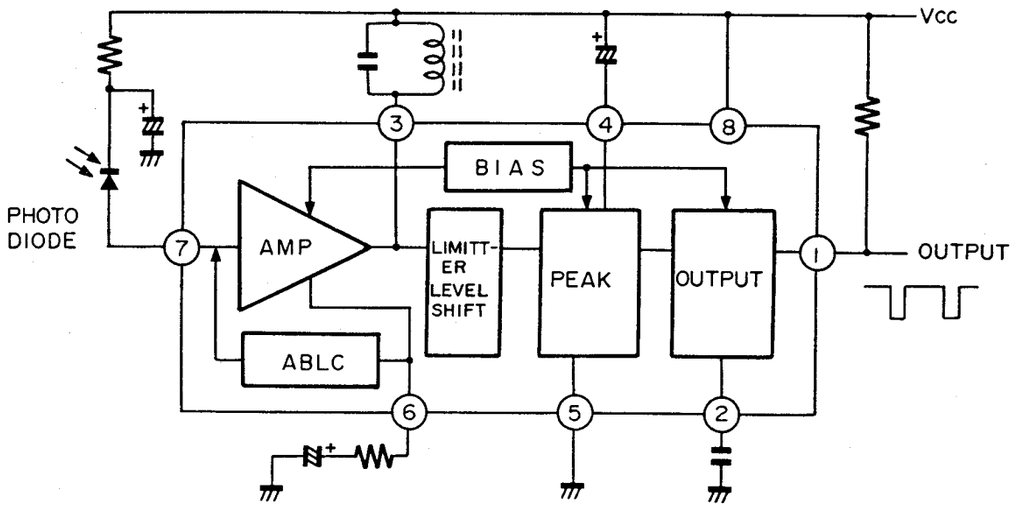
IC HM6116P-4
IC203



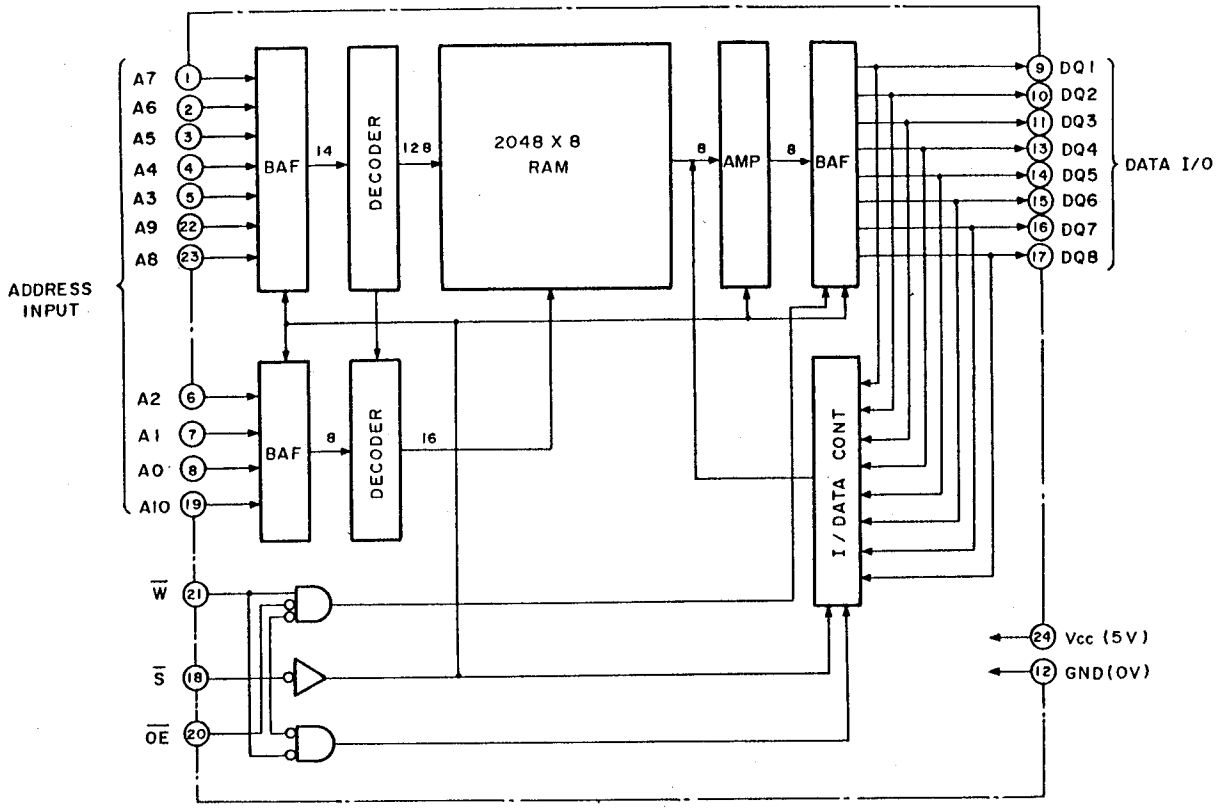
IC HD14053BP
IC302, 303



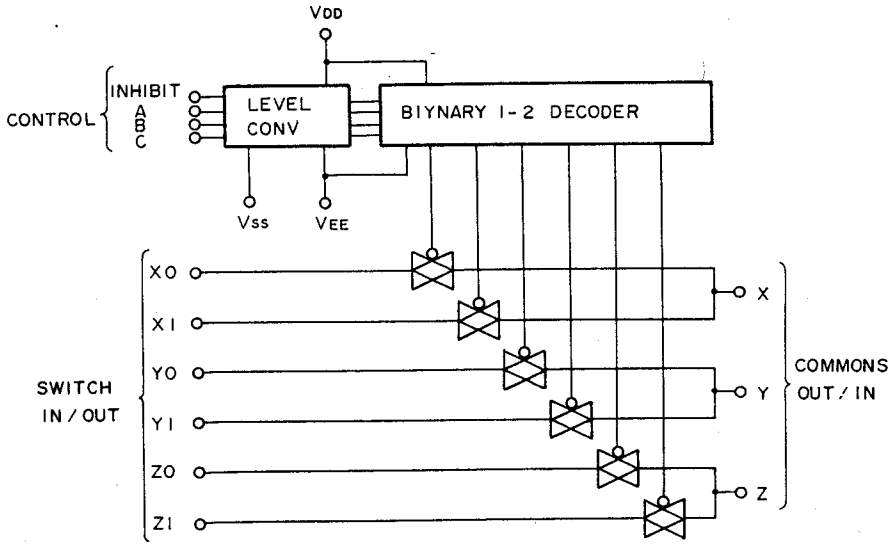
IC M5017P
IC402



IC μPC1473HA
IC601

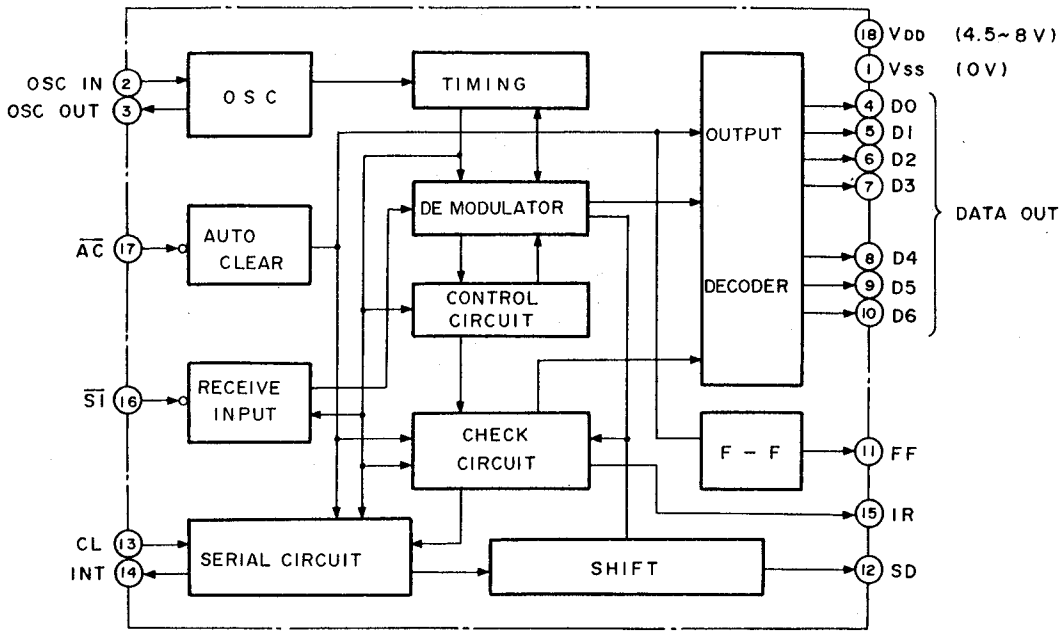


IC HM6116P-4
IC203

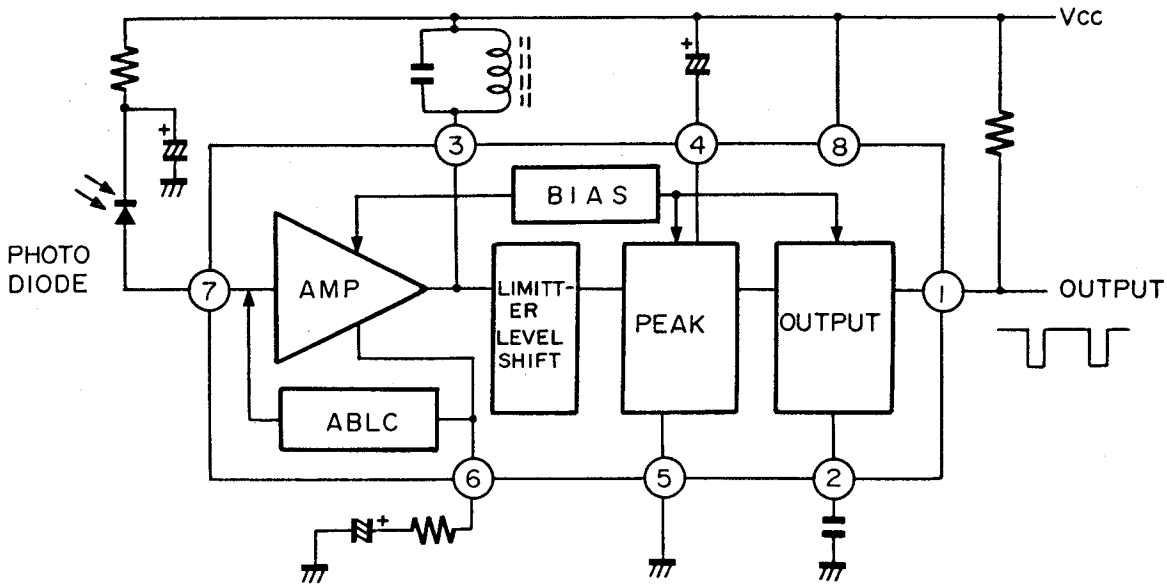


IC HD14053BP
IC302, 303

I/O



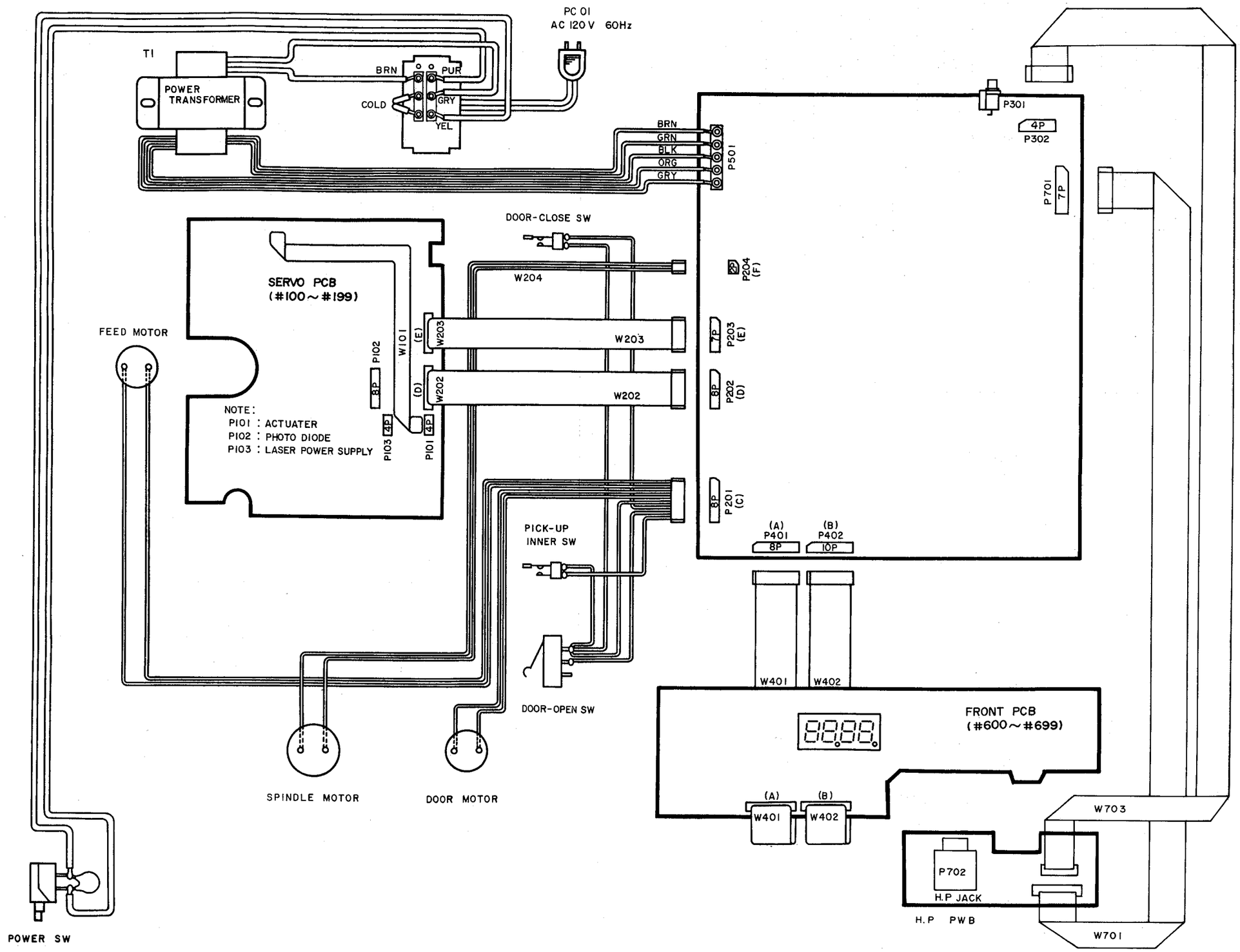
IC M5017P
IC402



IC μPC1473HA
IC601

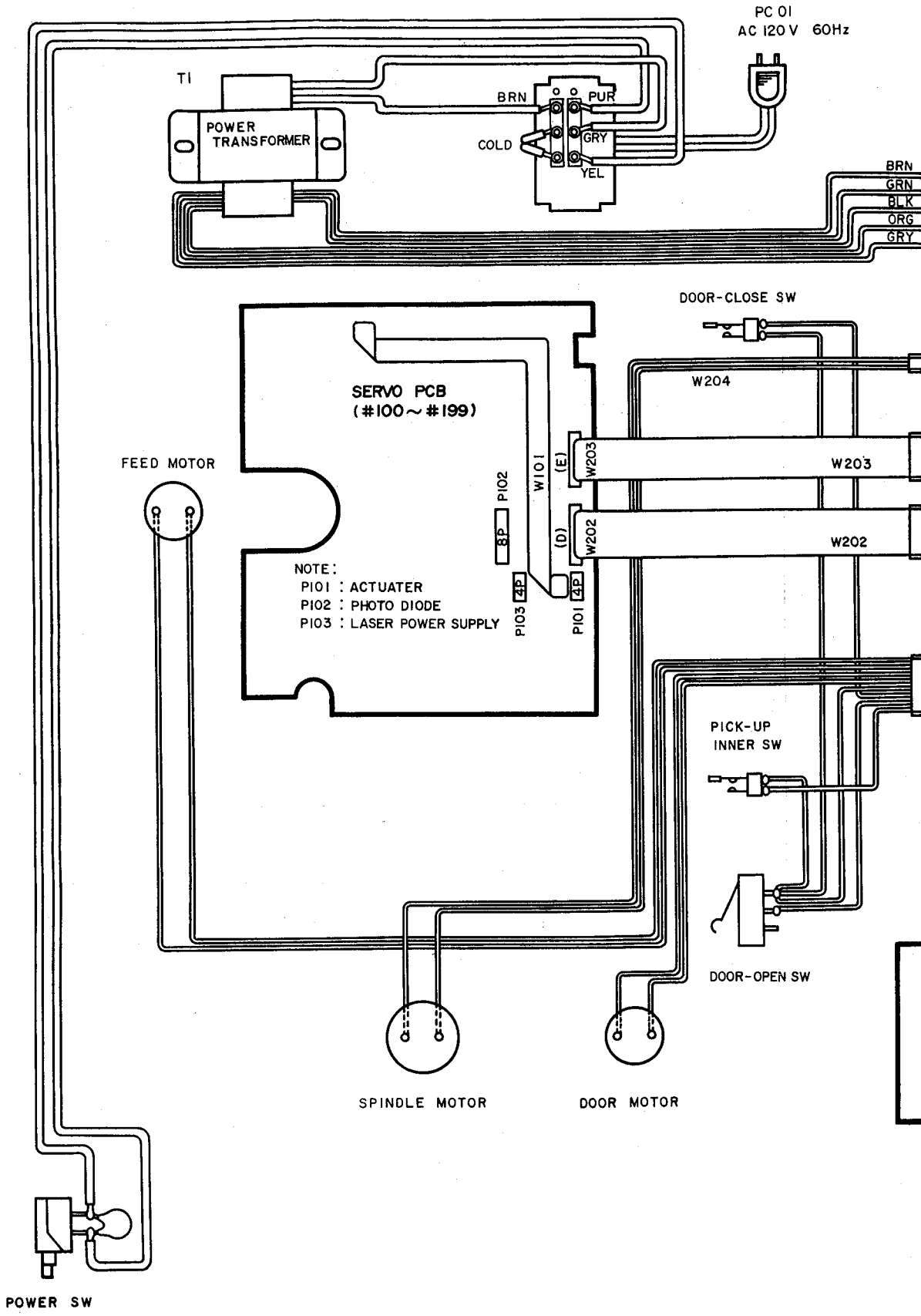
GENERAL WIRING DIAGRAM

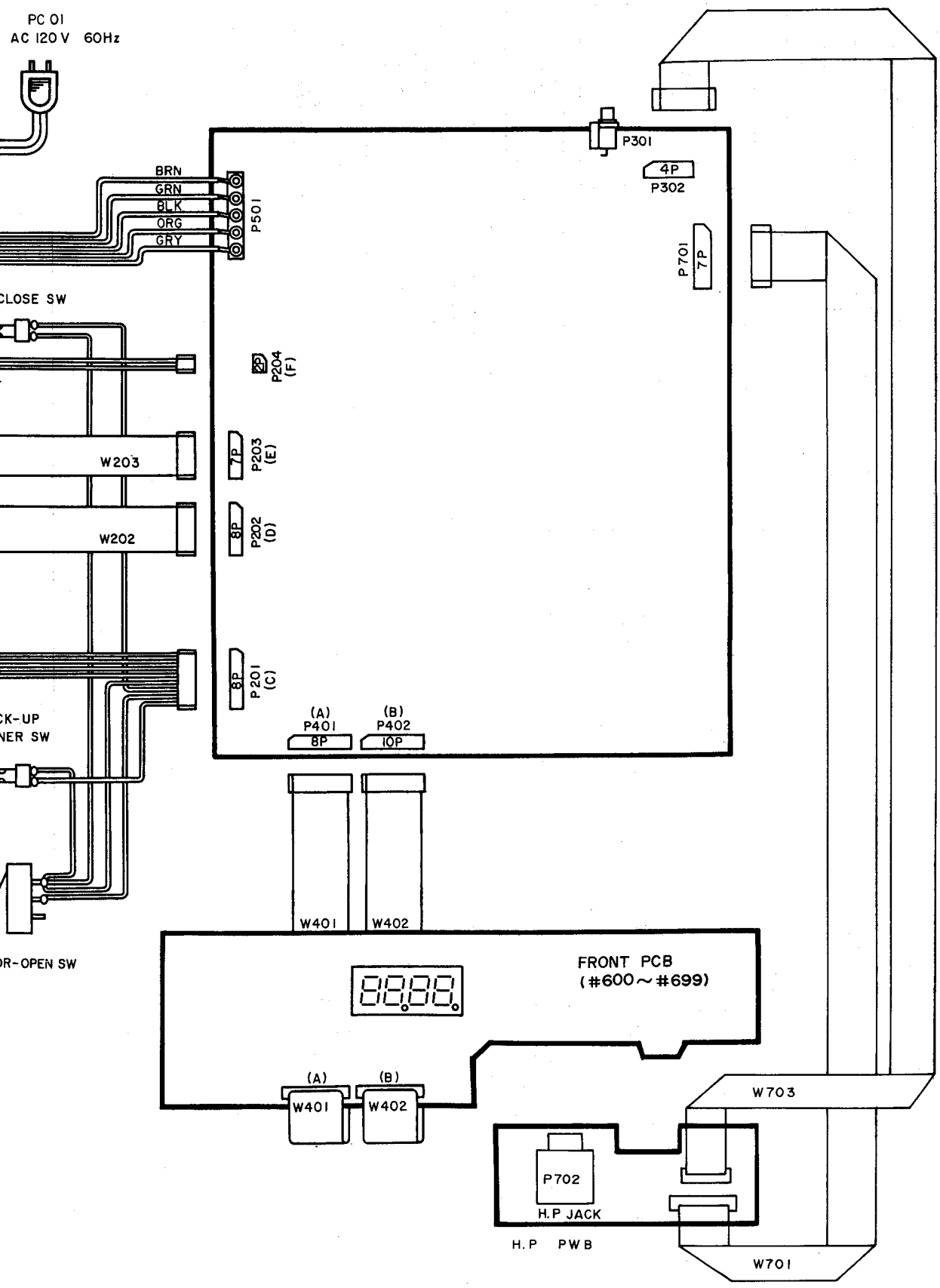
(FOR USA AND CANADA (A) MODELS)



GENERAL WIRING DIAGRAM

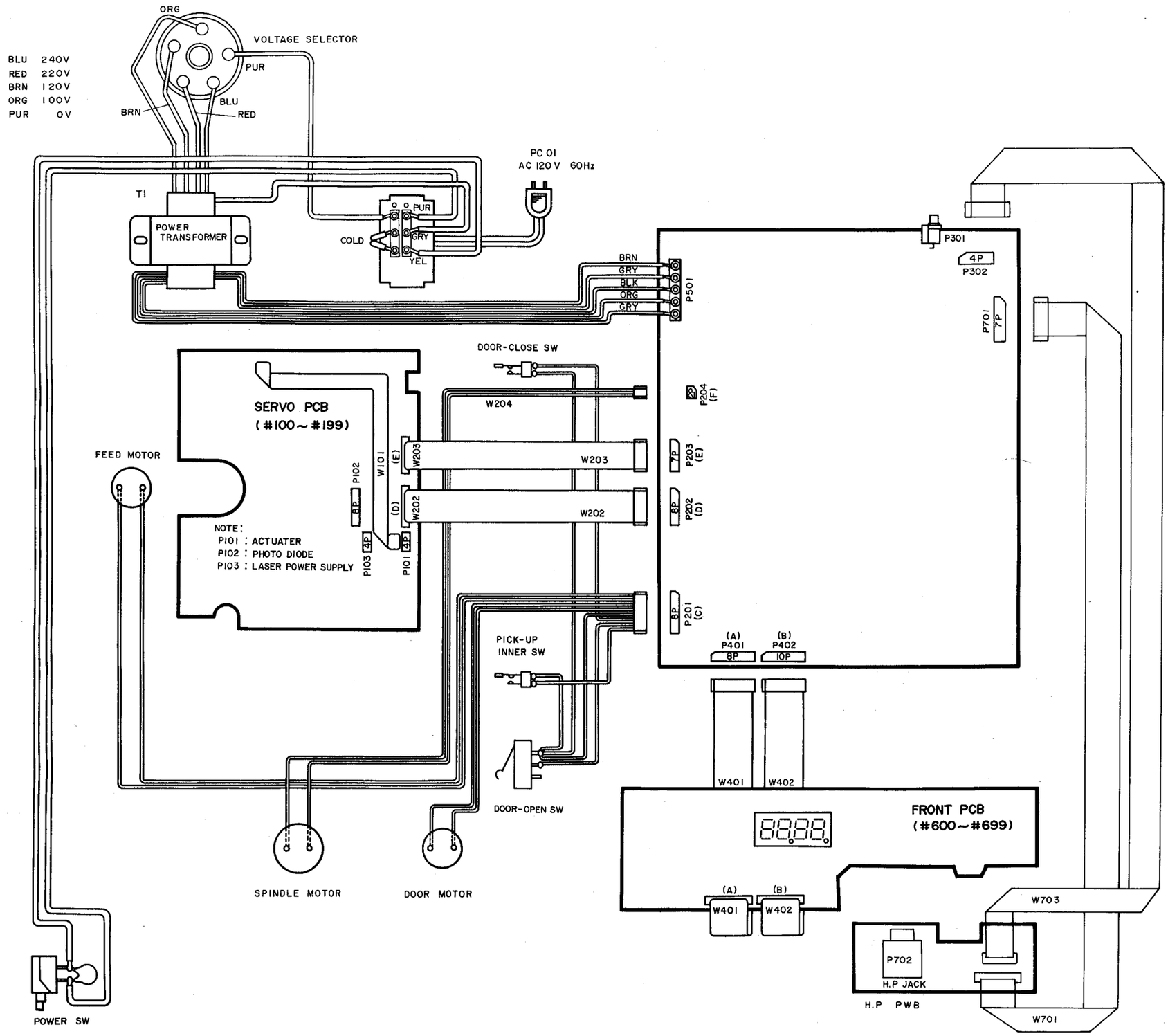
(FOR USA AND CANADA (A) MODELS)




PC 01
AC 120 V 60Hz
BRN
GRN
BLK
ORG
GRY
P501
CLOSE SW
W203
W202
CK-UP
NER SW
OR-OPEN SW
P301
4P
P302
P701
7P
P204
(F)
P203
(E)
7P
P202
(D)
8P
P201
(C)
8P
(A)
P401
8P
(B)
P402
10P
W401
W402
FRONT PCB
(#600~#699)
(A)
W401
(B)
W402
W703
P702
H.P JACK
H.P PWB
W701

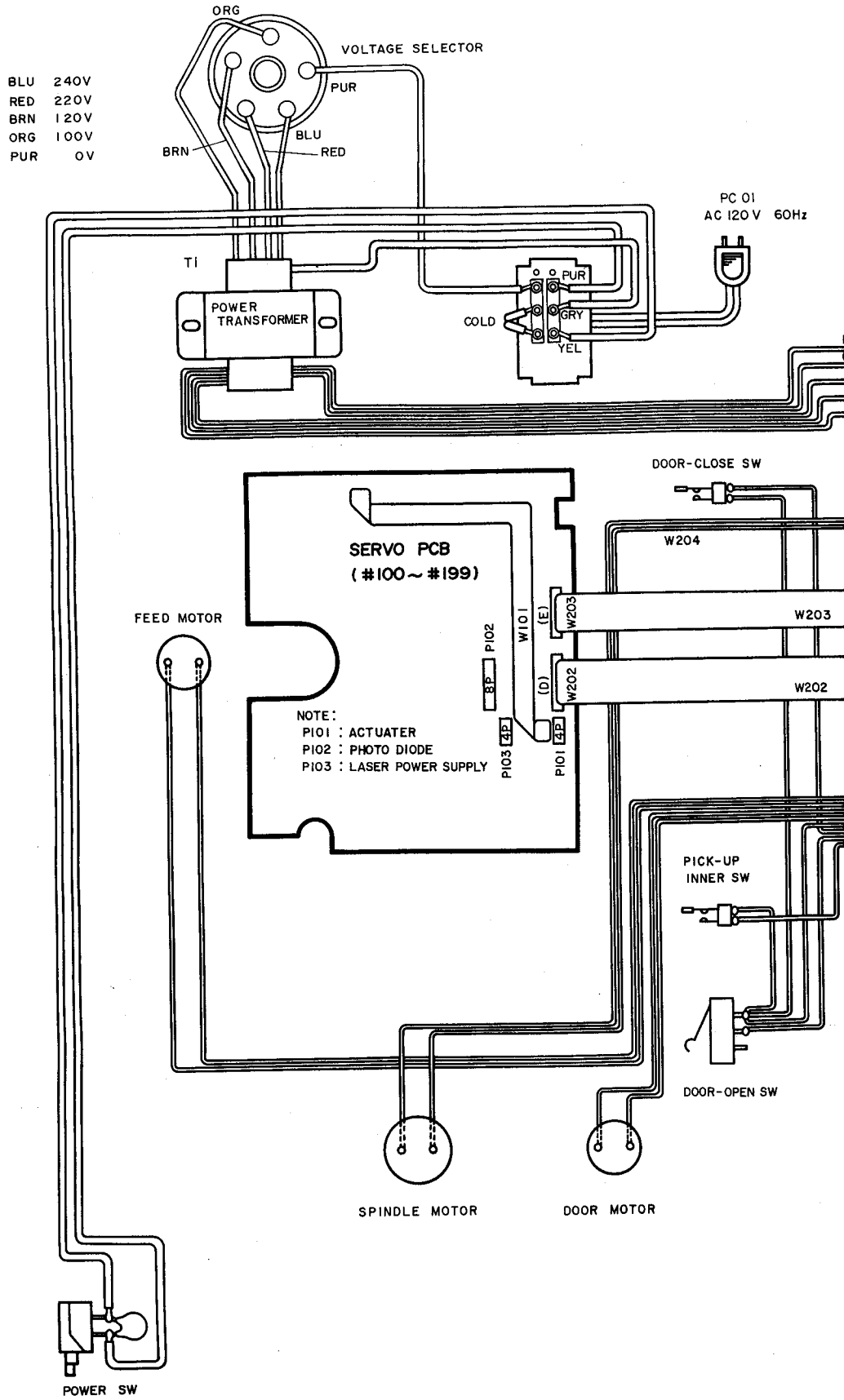
GENERAL WIRING DIAGRAM

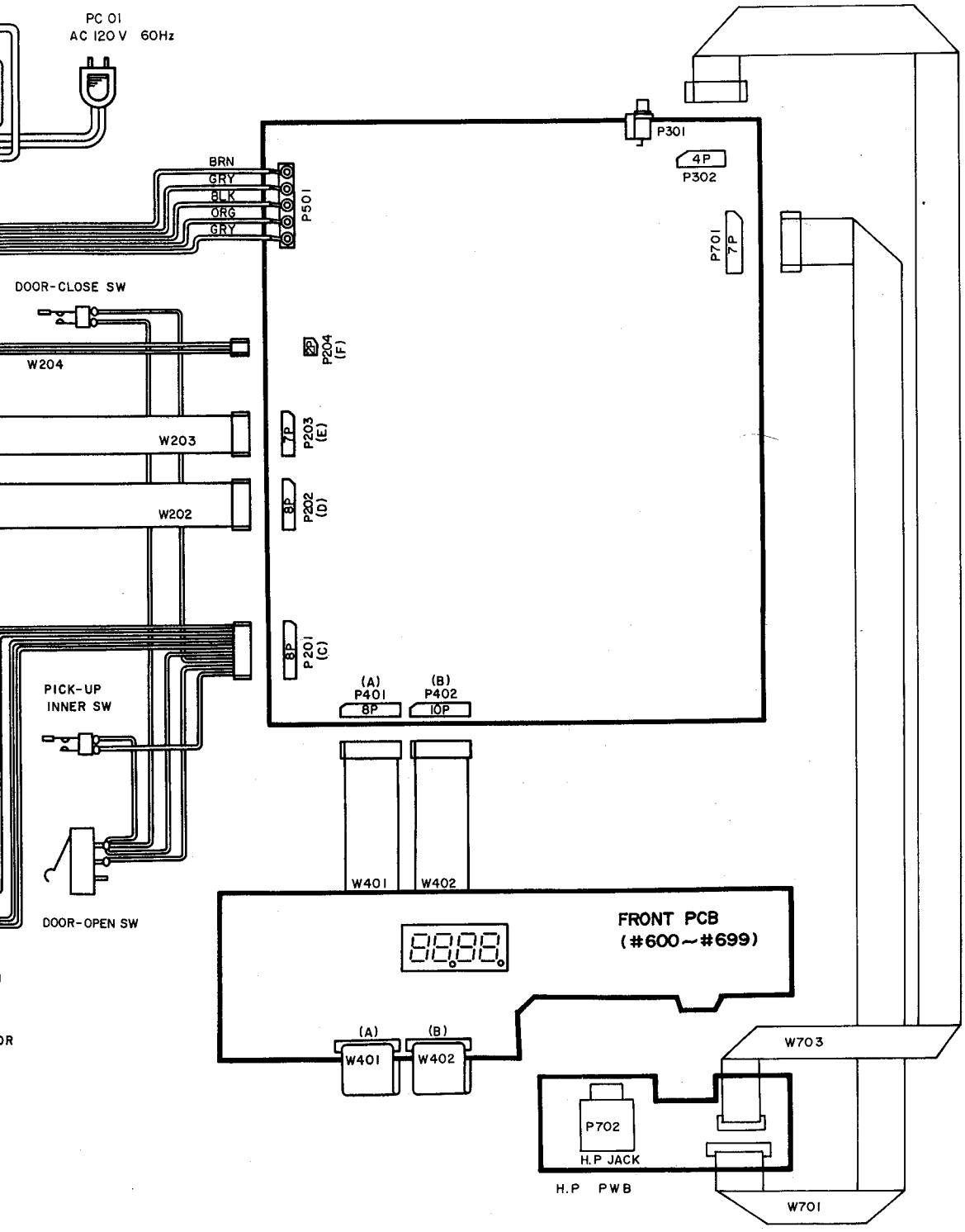
(FOR GENERAL (EW) MODEL)



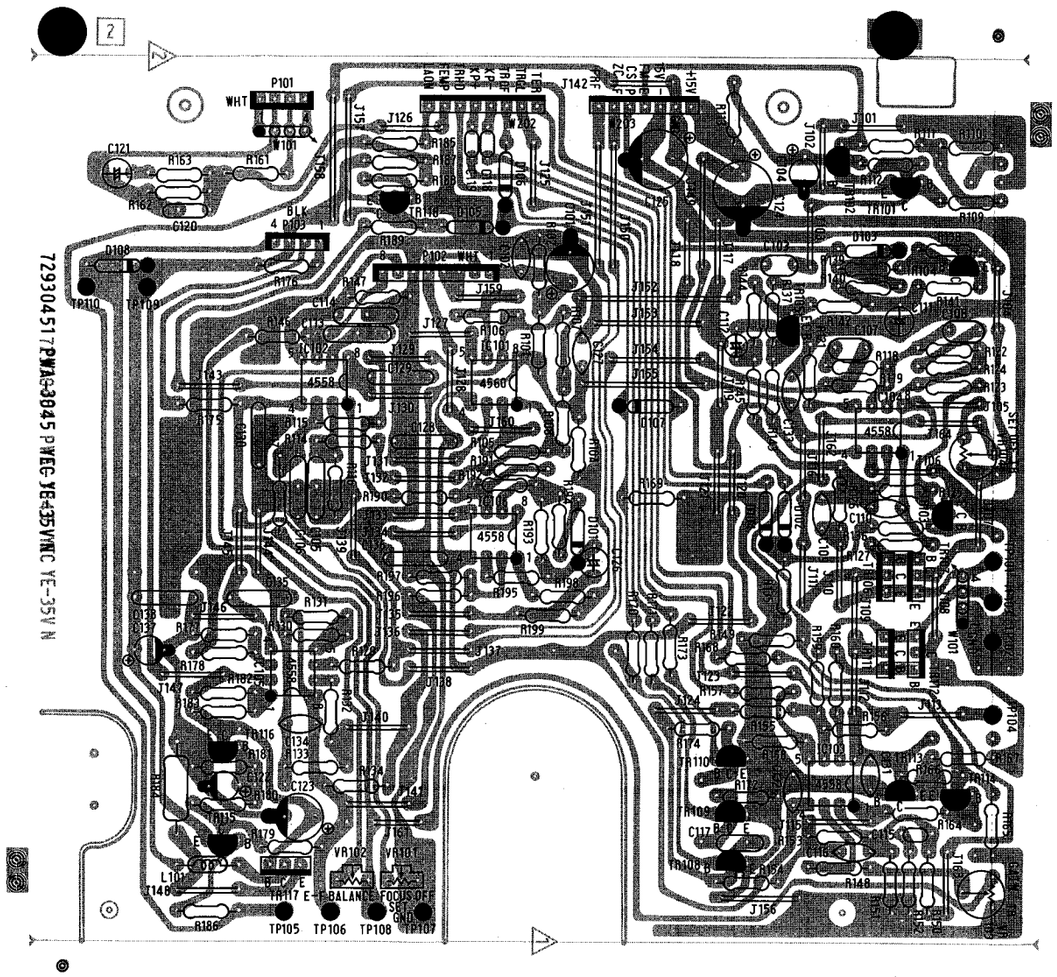
GENERAL WIRING DIAGRAM

(FOR GENERAL (EW) MODEL)




PC 01
AC 120 V 60Hz
BRN
GRY
BLK
ORG
GRY
P501
DOOR-CLOSE SW
W204
W203
W202
PICK-UP
INNER SW
DOOR-OPEN SW
P301
4P
P302
P701
7P
P204
(F)
7P
P203
(E)
8P
P202
(D)
8P
P201
(C)
(A)
P401
8P
(B)
P402
10P
W401
W402
FRONT PCB
(#600~#699)
(A)
W401
(B)
W402
W703
P702
H.P JACK
H.P PWB
W701

SERVO PCB ASSY — Solder Side —


P101
WHT
W101
C121
R163
R161
R162
C120
BLK
4 R103
D108
R189
R176
R187
C114
C115
D102
C102
4558
R106
R105
R104
R101
R102
R103
R107
R108
R109
R110
R111
R112
R113
R114
R115
R116
R117
R118
R119
R120
R121
R122
R123
R124
R125
R126
R127
R128
R129
R130
R131
R132
R133
R134
R135
R136
R137
R138
R139
R140
R141
R142
R143
R144
R145
R146
R147
R148
R149
R150
R151
R152
R153
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R191
R192
R193
R194
R195
R196
R197
R198
R199
C101
C103
C104
C105
C106
C107
C108
C109
C110
C111
C112
C113
C116
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C119
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C148
C149
C150
C151
C152
C153
C154
C155
C156
C157
C158
C159
C160
C161
C162
D101
D103
D104
D105
D106
D107
D109
D110
D111
D112
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D114
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D135
D136
D137
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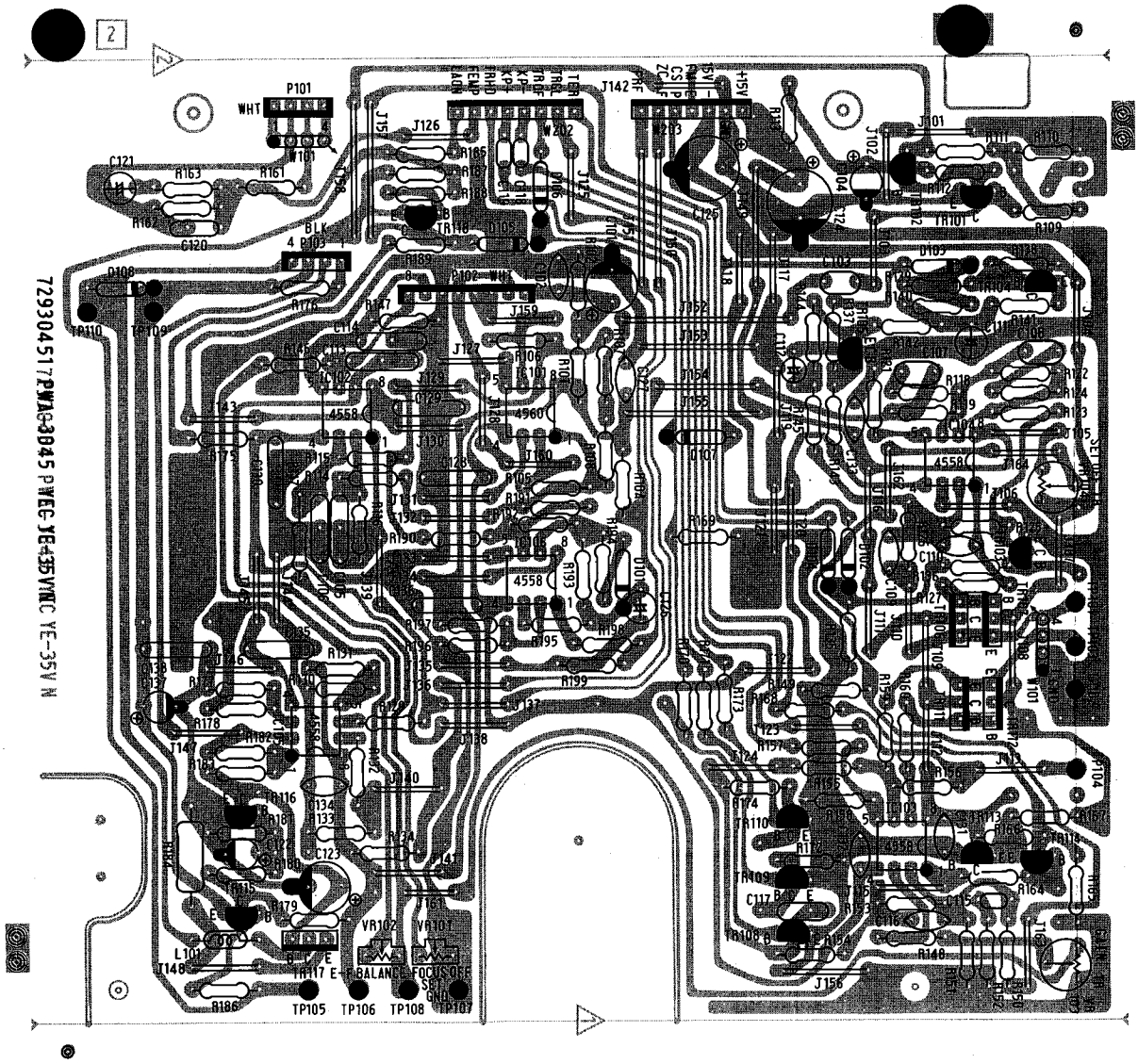
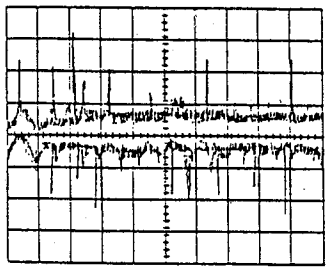
D140
D141
D142
D143
D144
D145
D146
D147
D148

SERVO PCB ASSY —Solder Side—

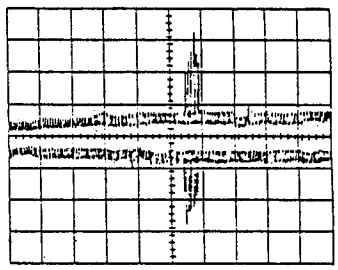


W2



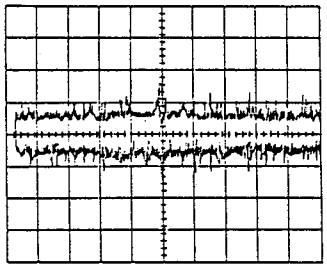
TP101 ↔ TP102 (GND)
Play Renge 1V 0.5ms

W3



TP103 ↔ TP102 (GND)
Play Renge 1V 0.5ms

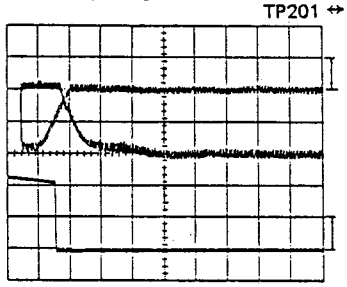
W4



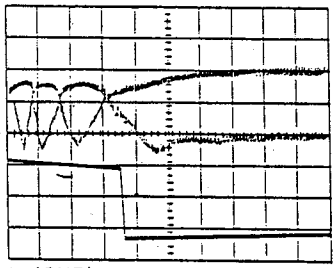
TP108 ↔ TP107 (GND)
Play Renge 1V 0.5ms

TP201 ↔ TP202 (GND)

W5

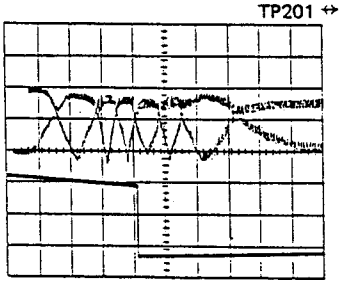


Pause Waveform. TP104 ↔ TP107 (GND)

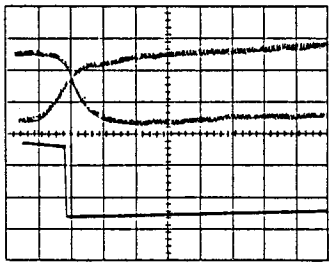


Cue Waveform

TP201 ↔ TP202 (GND)

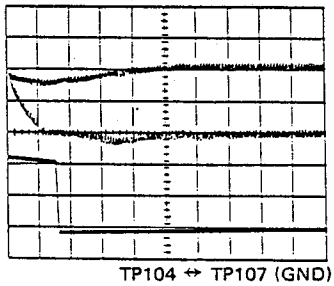


REW Waveform TP104 ↔ TP107 (GND)

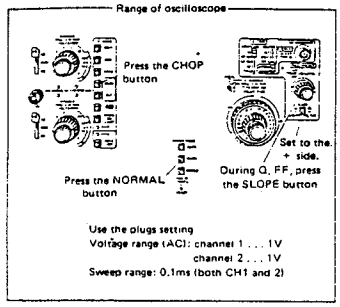


REV Waveform

TP201 ↔ TP202 (GND)

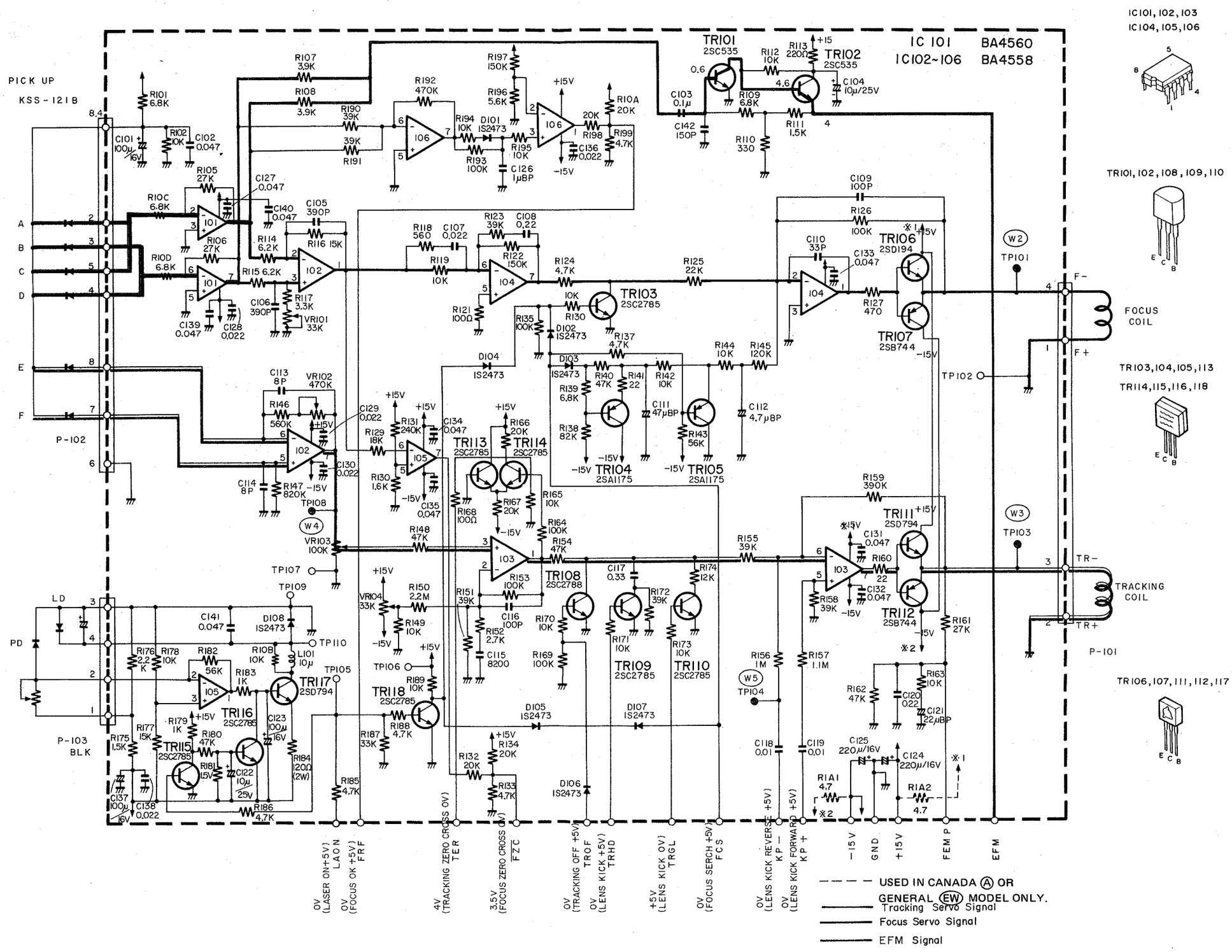


TP104 ↔ TP107 (GND)
FF Waveform

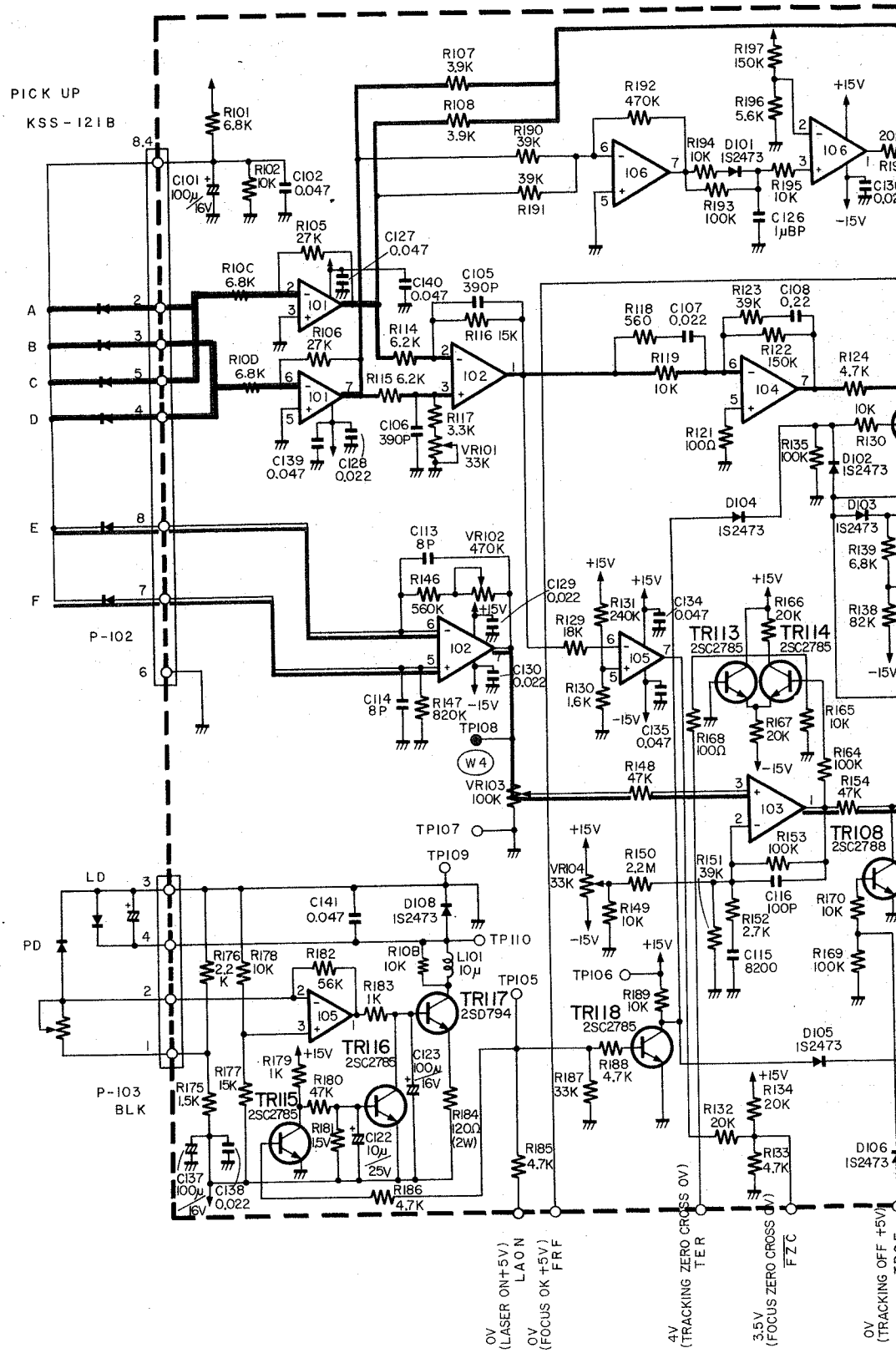

Range of oscilloscope
Press the CHOP button
Press the NORMAL button
Set to the + side.
During Q, FF, press the SLOPE button
Use the plugs setting
Voltage range (AC): channel 1 . . . 1V
channel 2 . . . 1V
Sweep range: 0.1ms (both CH1 and 2)

SERVO CIRCUIT DIAGRAM

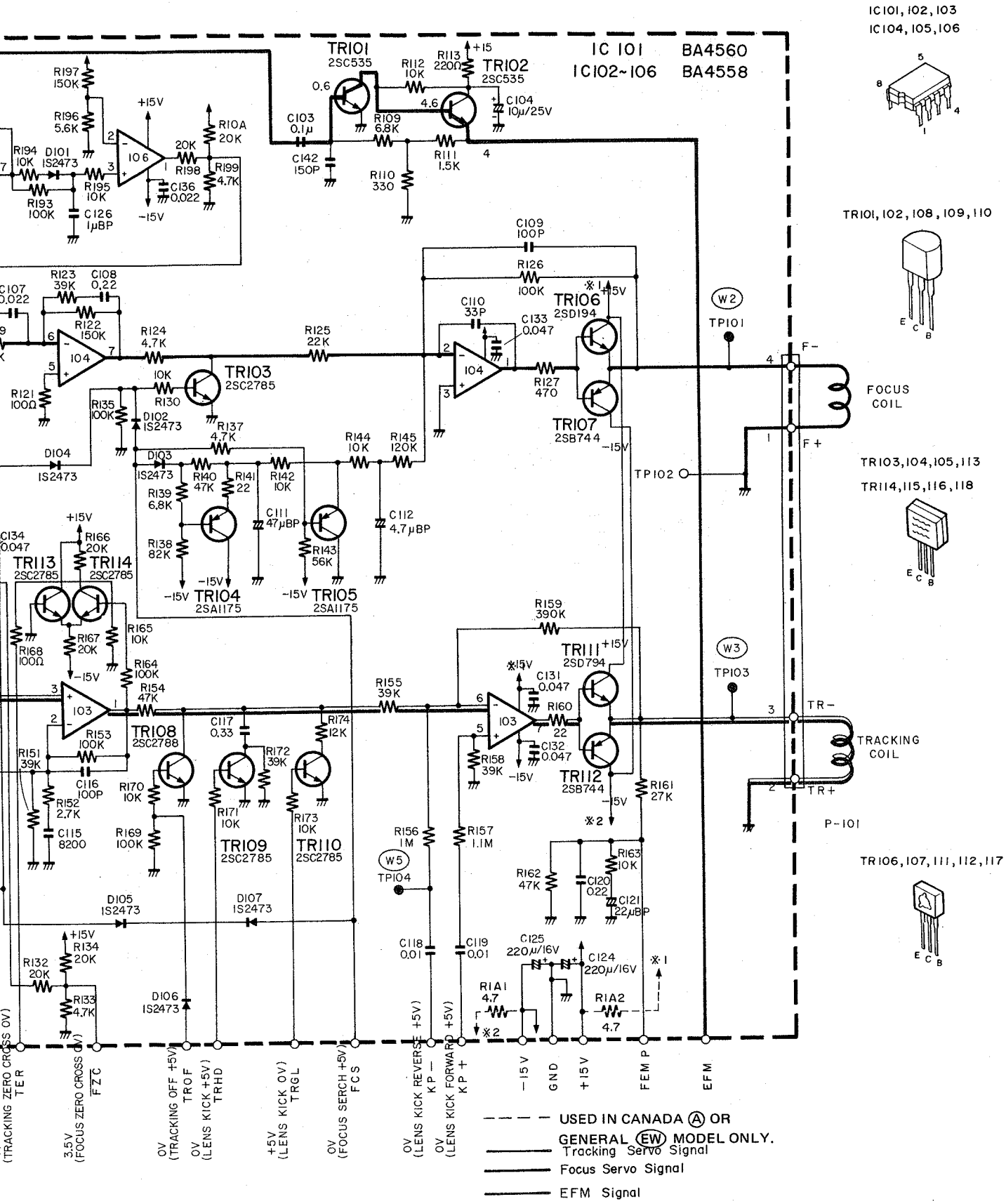
Note: The voltage values +15 and -15 are indicated as +B and -B respectively in the schematic.



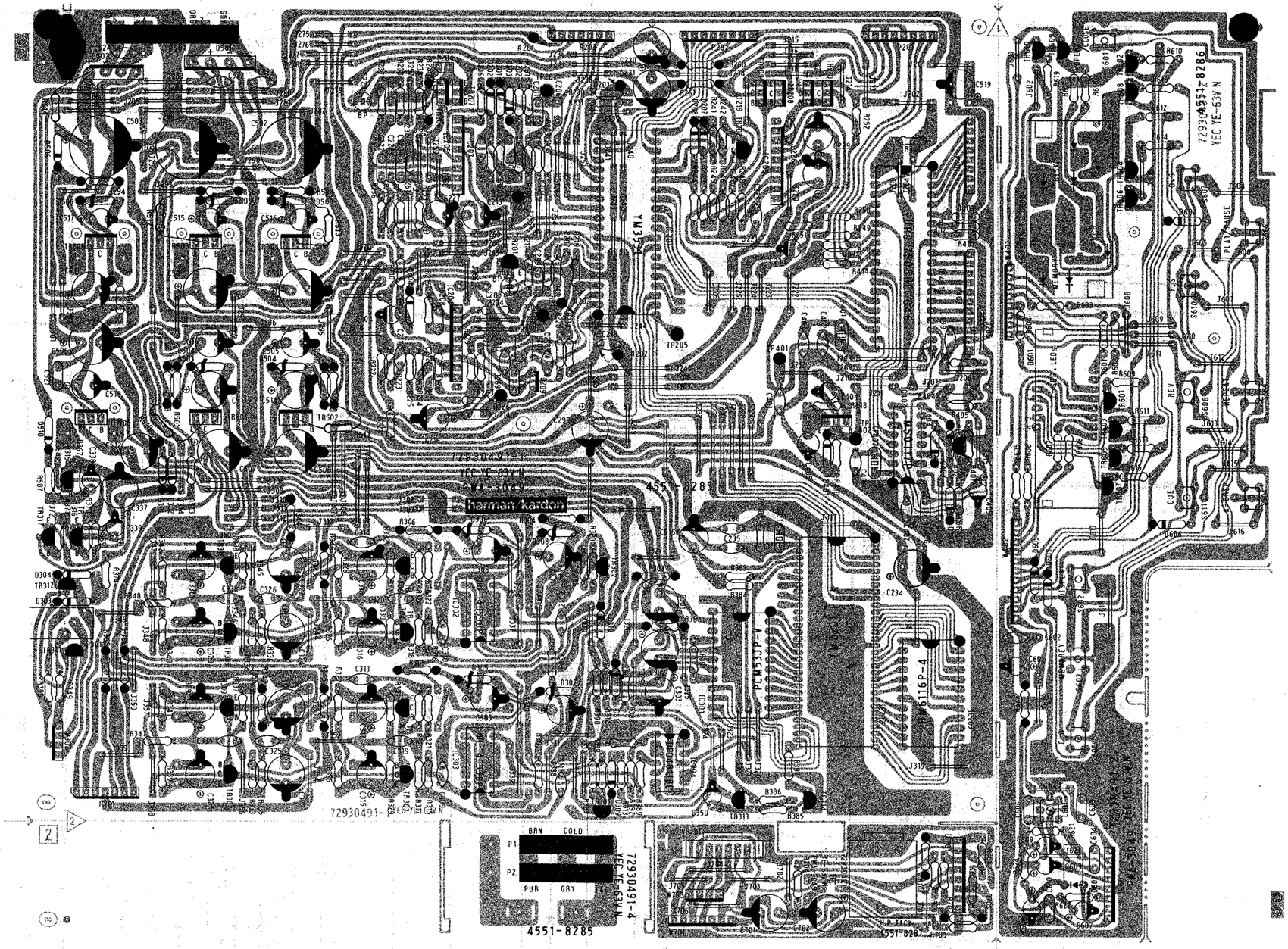
SERVO CIRCUIT DIAGRAM



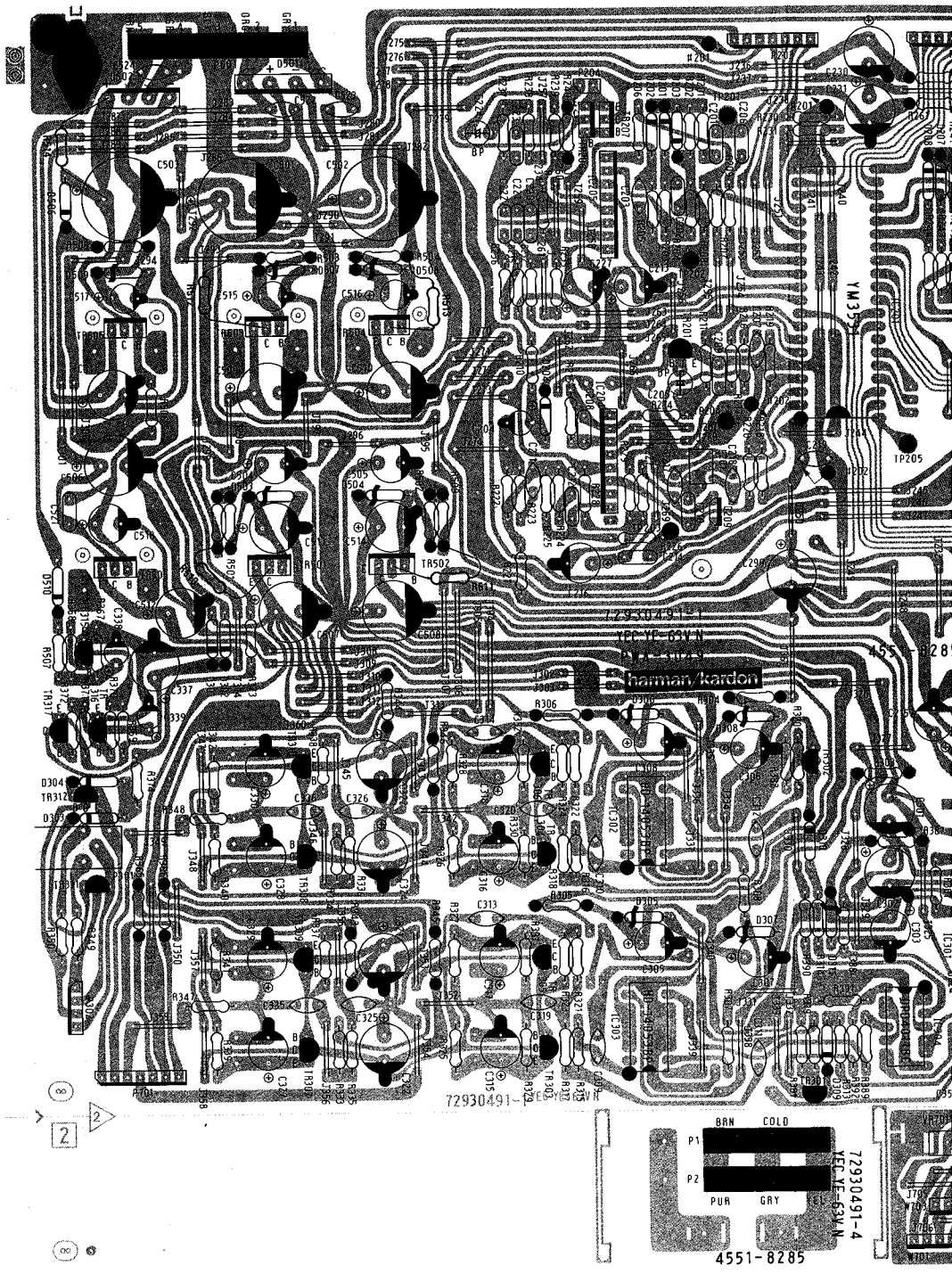
Note: The voltage values +15 and -15 are indicated as +B and -B respectively in the schematic.



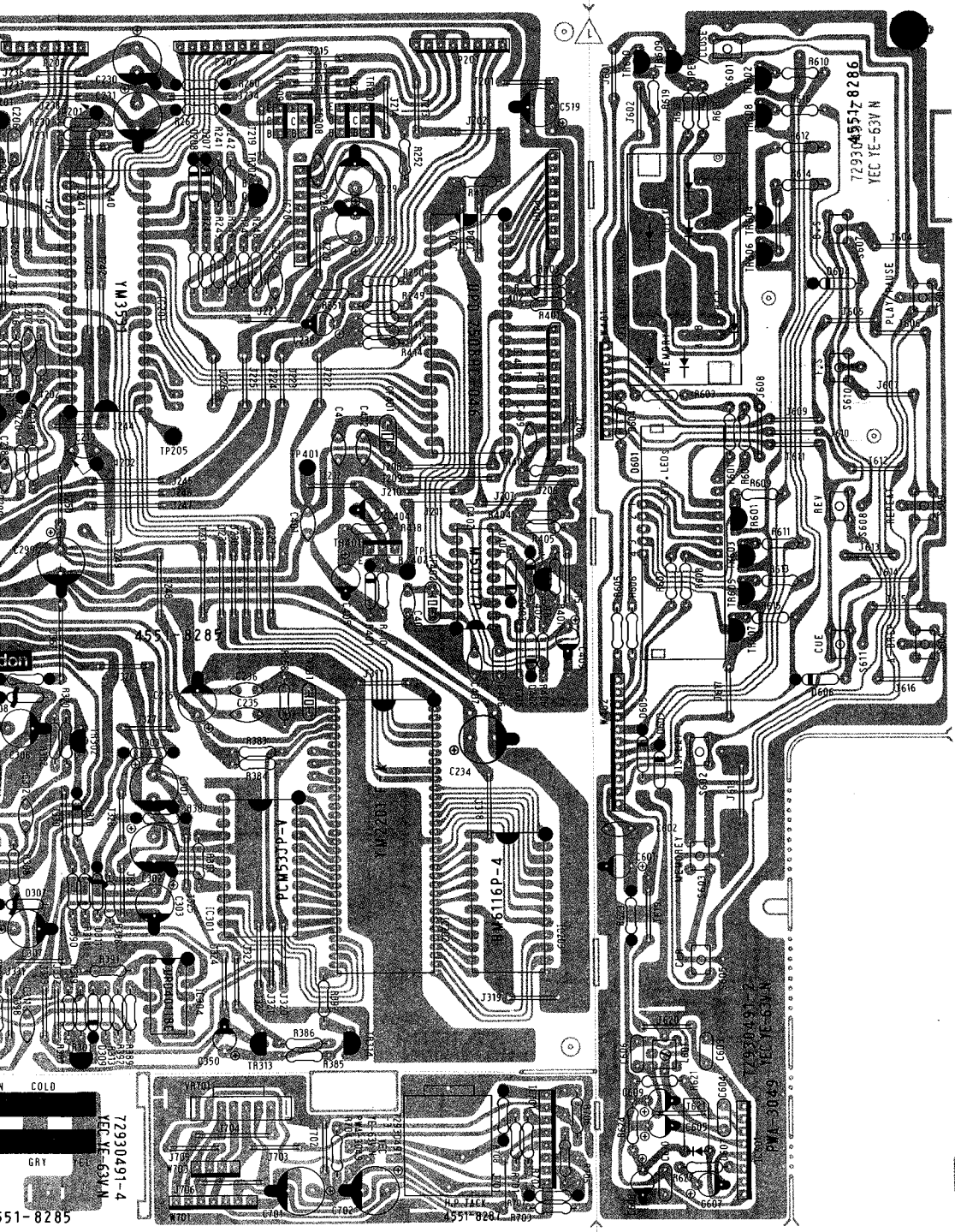
MAIN PCB ASSY (Solder Side)



MAIN PCB ASSY (Solder Side)



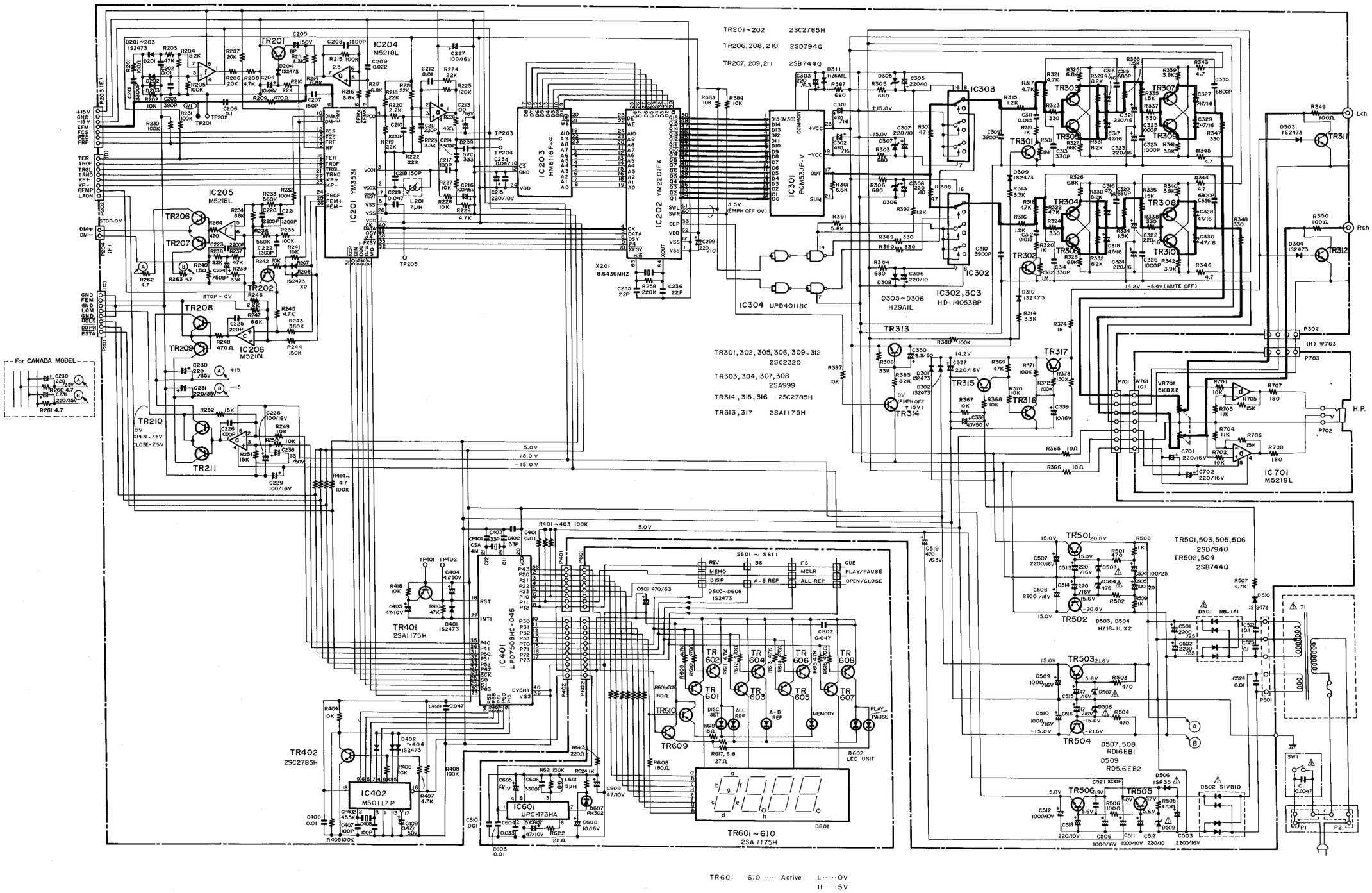
lder Side)


4551-8285
4551-8286
PCM53JP-V
BH6116P-4
YM3553
PWA-3049
PLAY/PAUSE
CUE
REV
COLD
GRY

MAIN CIRCUIT DIAGRAM

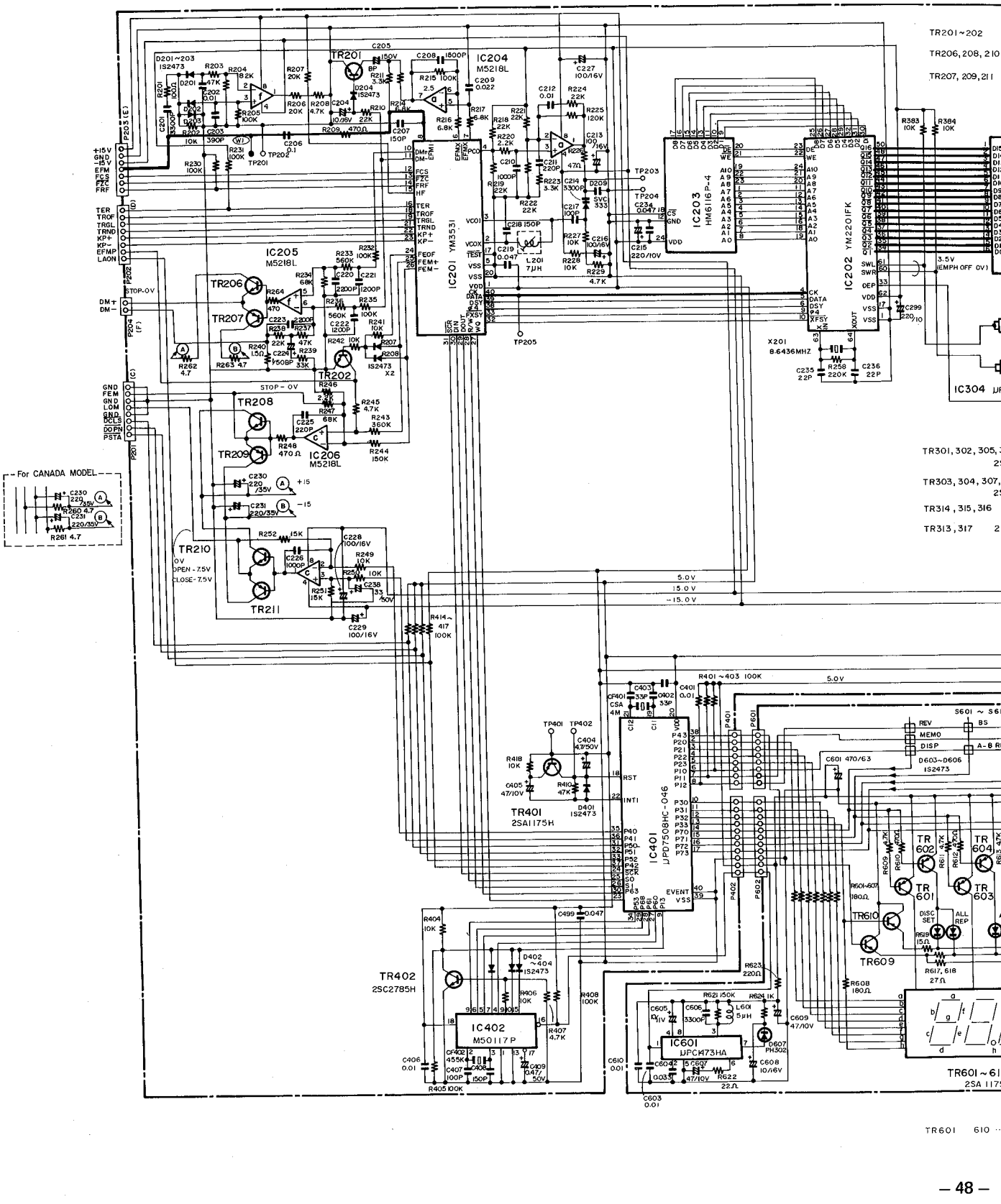
(FOR USA AND CANADA (A) MODELS)

PRODUCT SAFETY SHOULD BE CONSIDERED WHEN COMPONENT REPLACEMENT IS MADE IN ANY AREA OF A UNIT. THE ⚠ BESIDE A PART IN THE PARTS LIST THE SCHEMATIC DIAGRAM DESIGNATES COMPONENTS IN WHICH SAFETY CAN BE OF SPECIAL SIGNIFICANCE. IT IS PARTICULARLY RECOMMENDED THAT EXACT CATALOGED PARTS BE USED FOR REPLACEMENT OF COMPONENTS WHICH ARE DESIGNATED BY A ⚠, IN THE PARTS LIST AND THE SHADED AREAS ON THE SCHEMATIC DIAGRAM. USE OF SUBSTITUTE REPLACEMENT PARTS WHICH DO NOT HAVE THE SAME SAFETY CHARACTERISTICS AS RECOMMENDED IN FACTORY SERVICE INFORMATION MAY CREATE SHOCK, FIRE OR OTHER HAZARDS.



MAIN CIRCUIT DIAGRAM

(FOR USA AND CANADA (A) MODELS)



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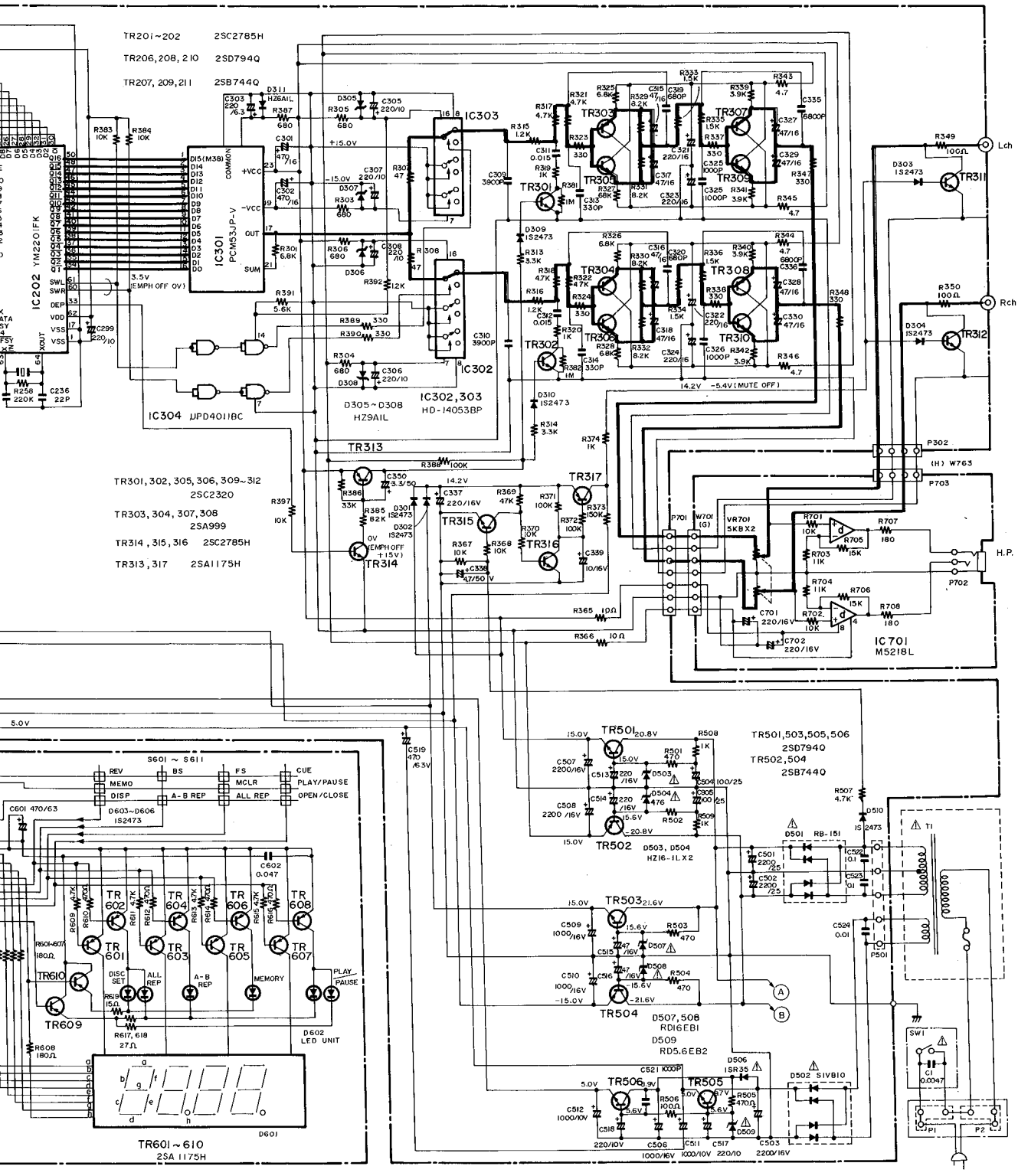

MAIN CIRCUIT DIAGRAM

(FOR GENERAL (EW) MODEL)

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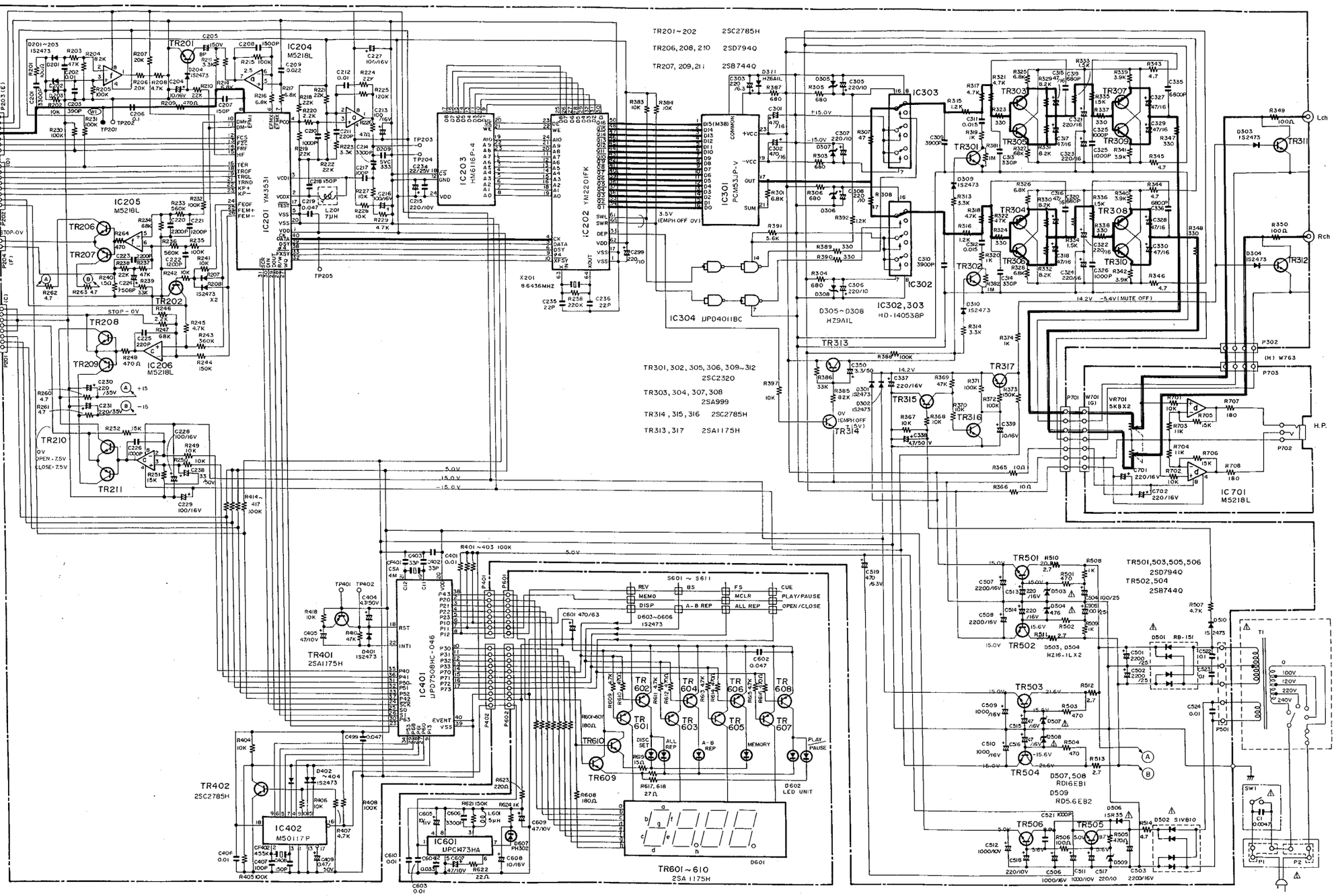
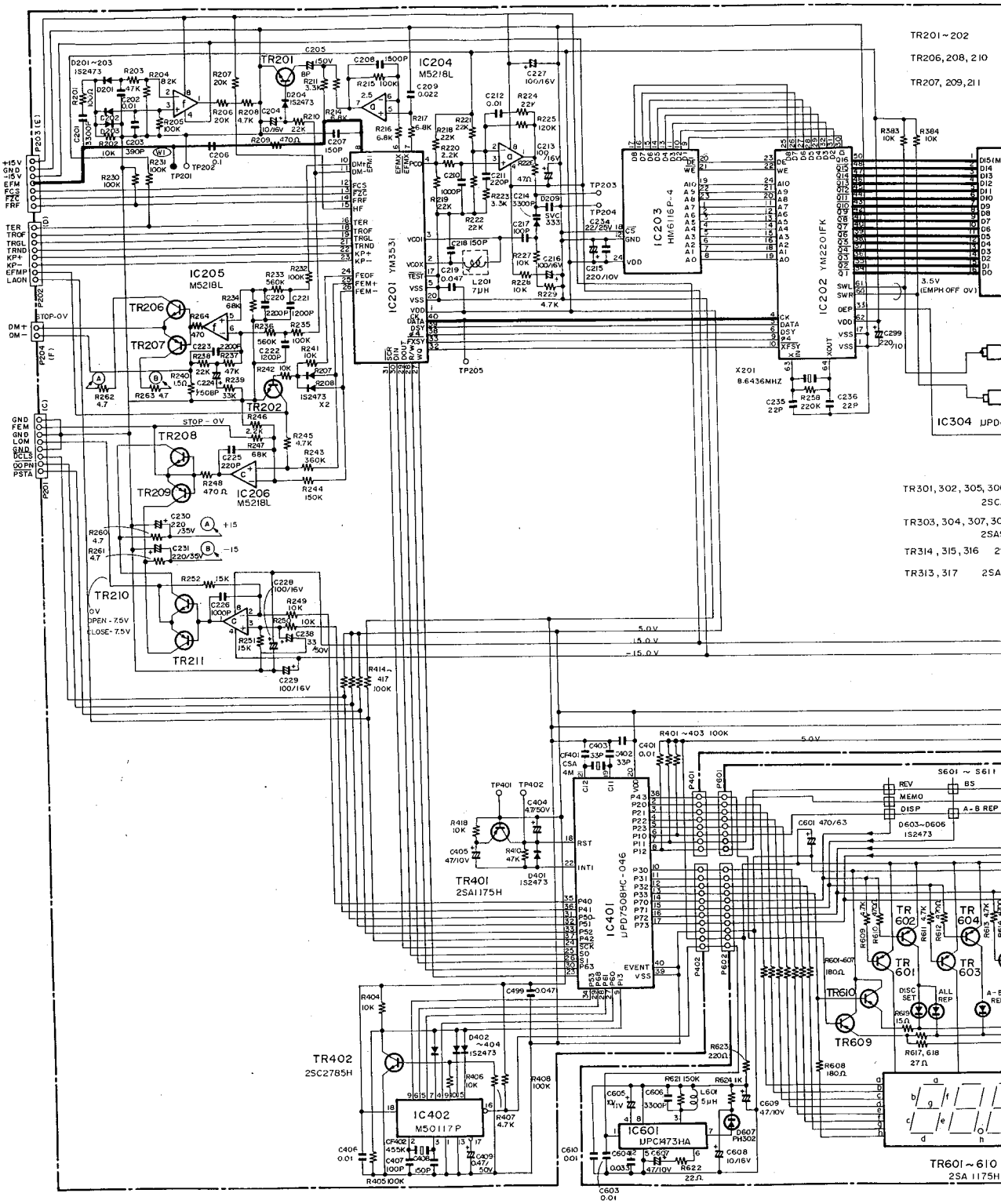


TR601 610 ····· Active L ····· 0V
H ····· 5V

MAIN CIRCUIT DIAGRAM

(FOR GENERAL (EW) MODEL)



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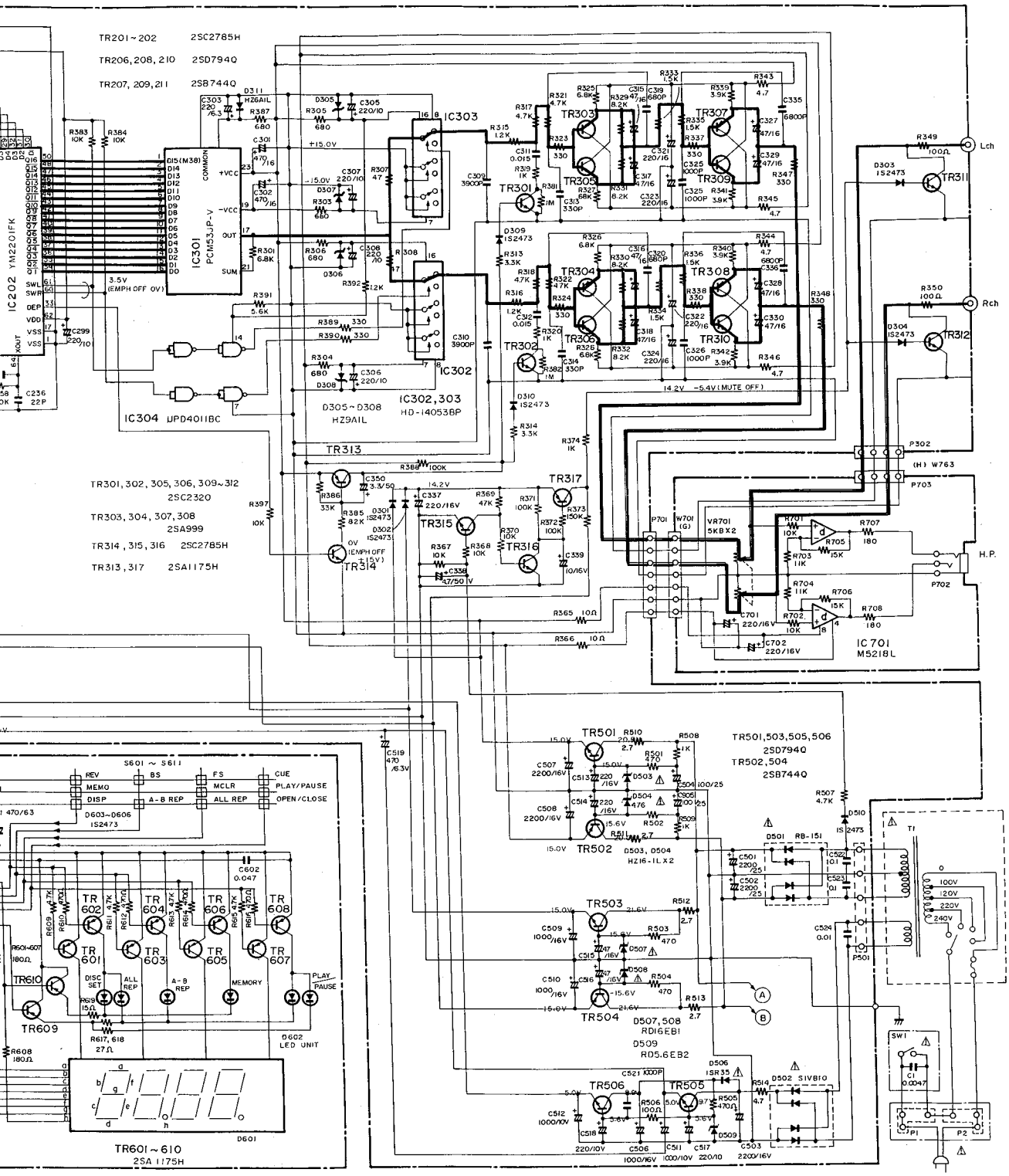
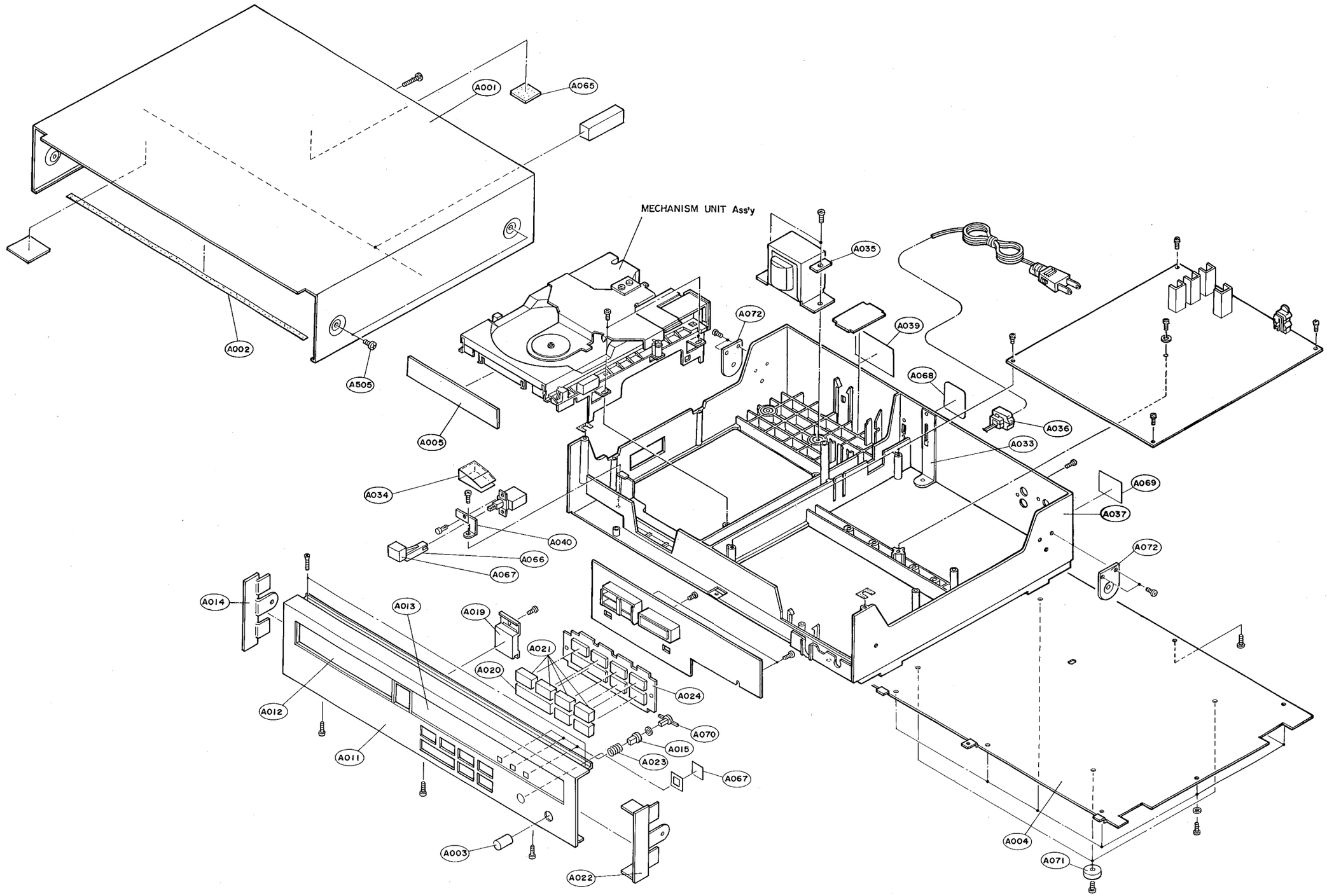


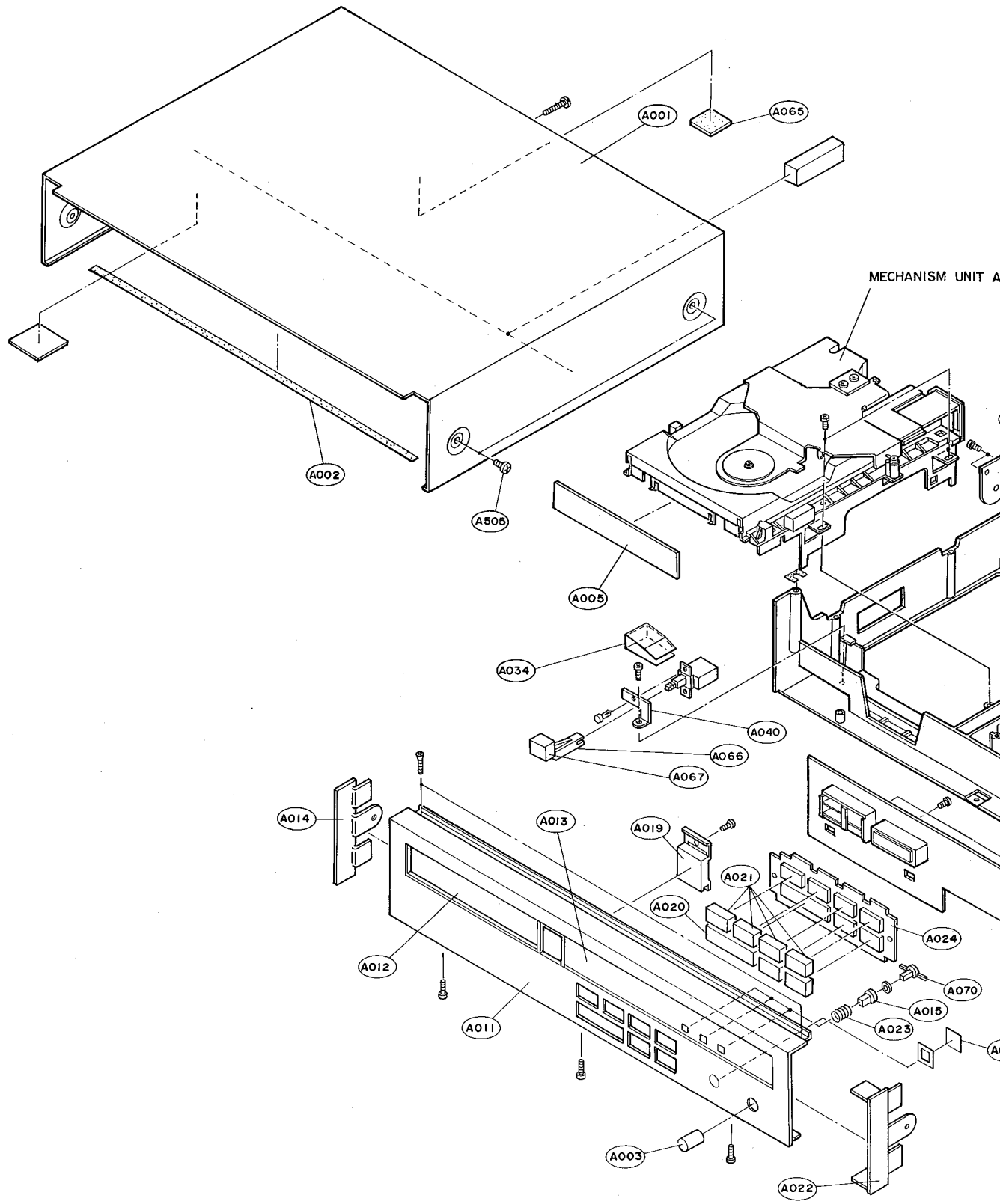
EXPLODED VIEW OF SET

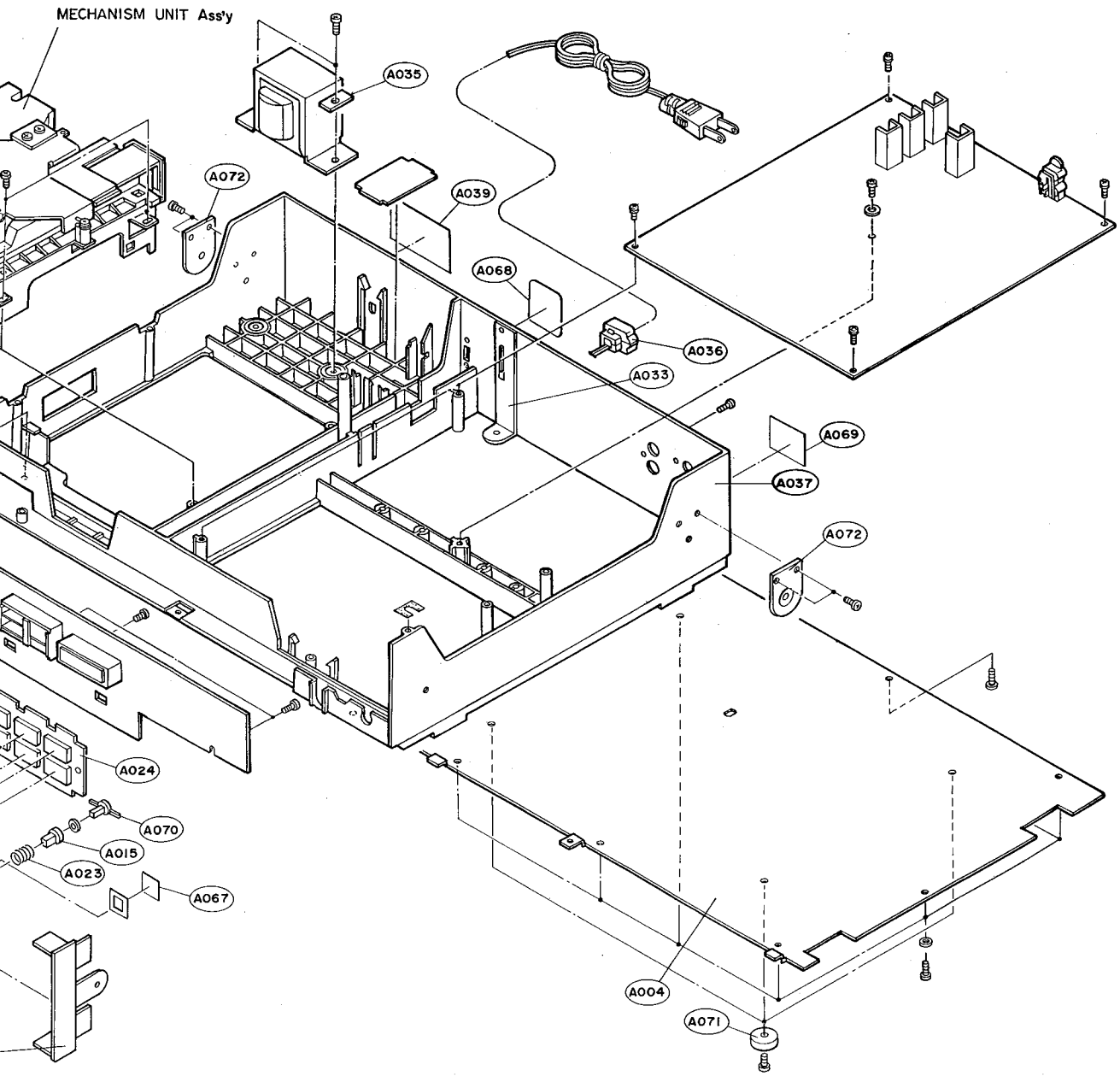
(FOR USA AND CANADA (A) MODELS)



EXPLODED VIEW OF SET

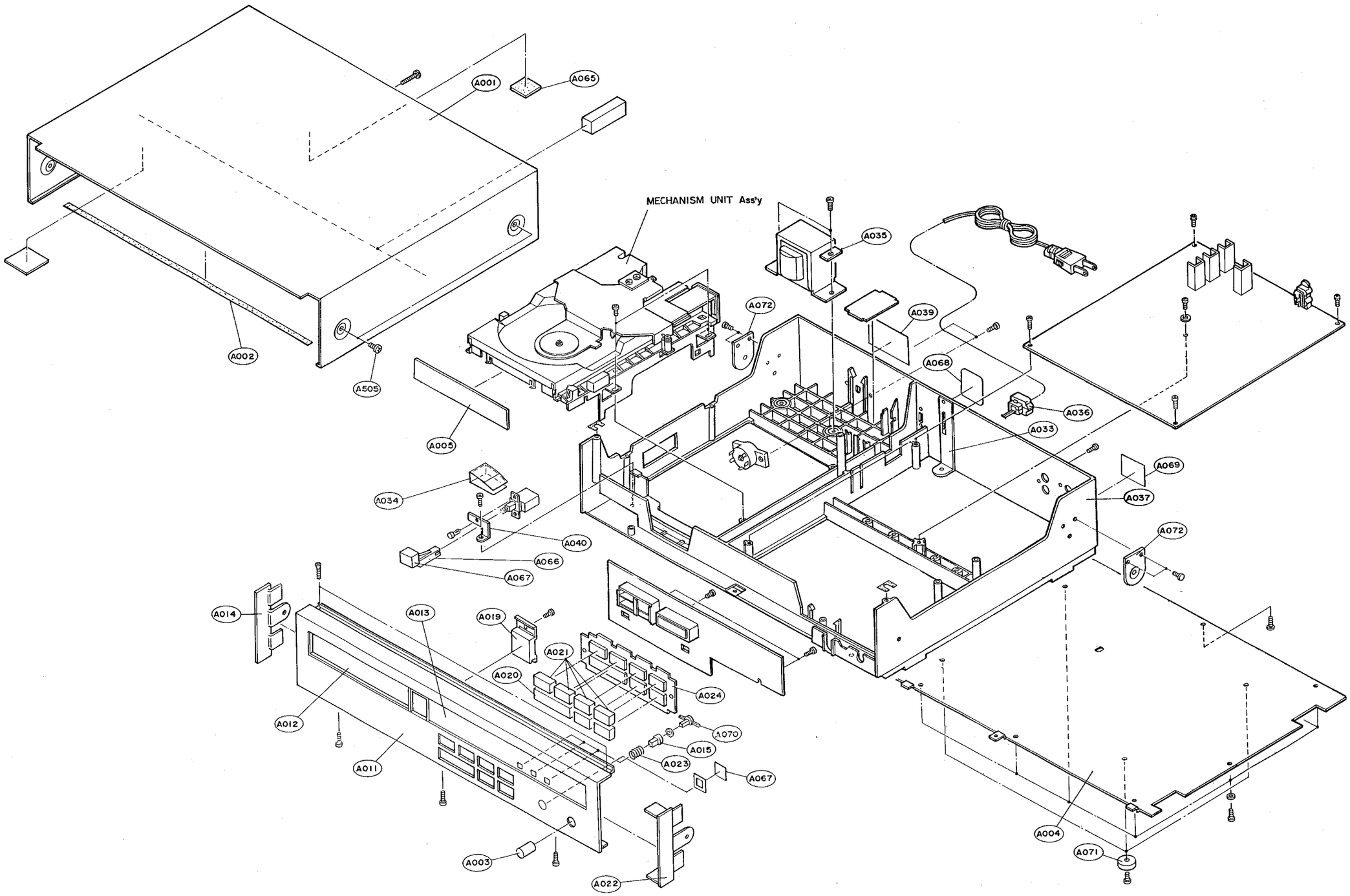
(FOR USA AND CANADA (A) MODELS)




MECHANISM UNIT Ass'y
A035
A072
A039
A068
A036
A033
A069
A037
A072
A024
A070
A015
A023
A067
A004
A071

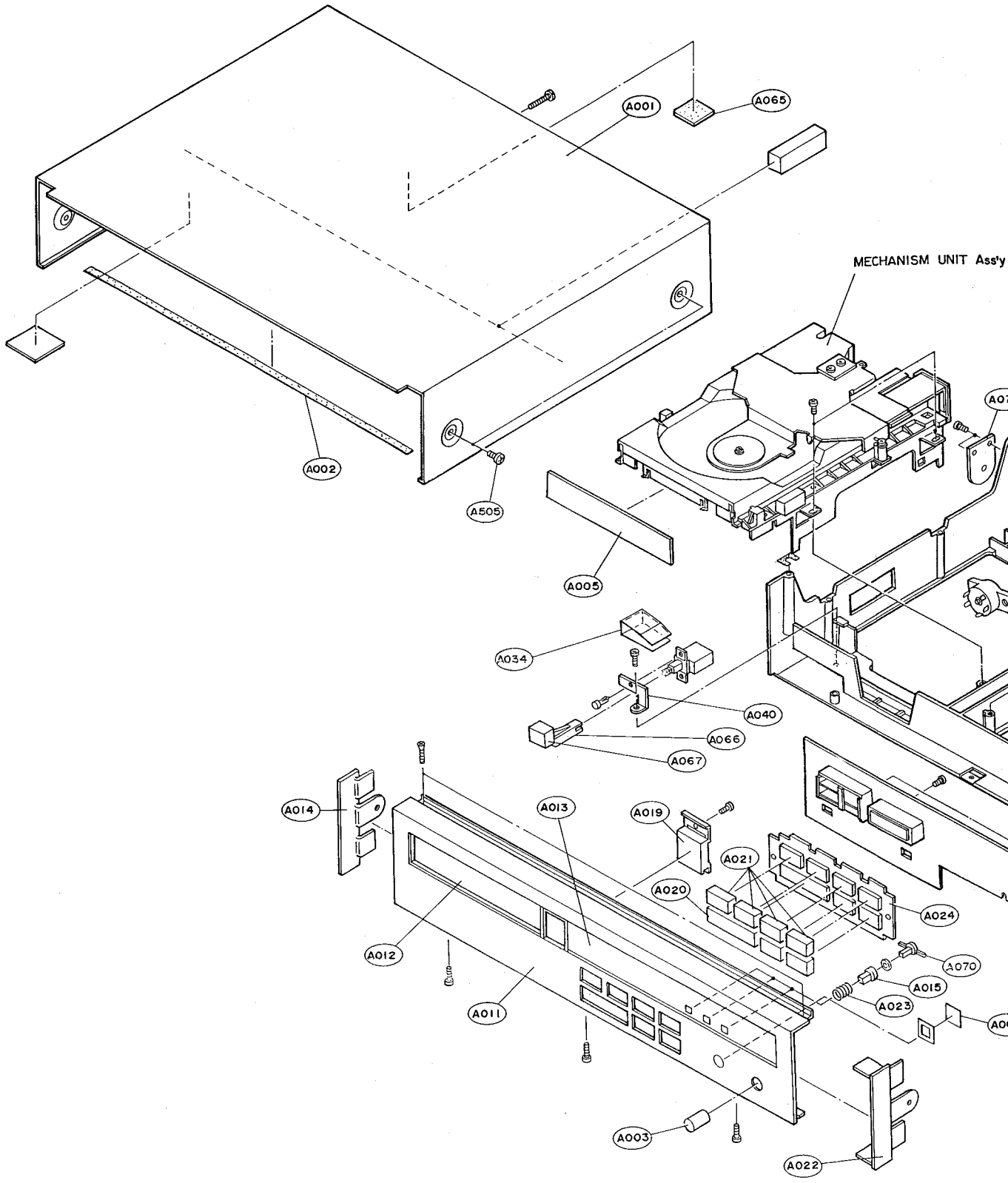
EXPLODED VIEW OF SET

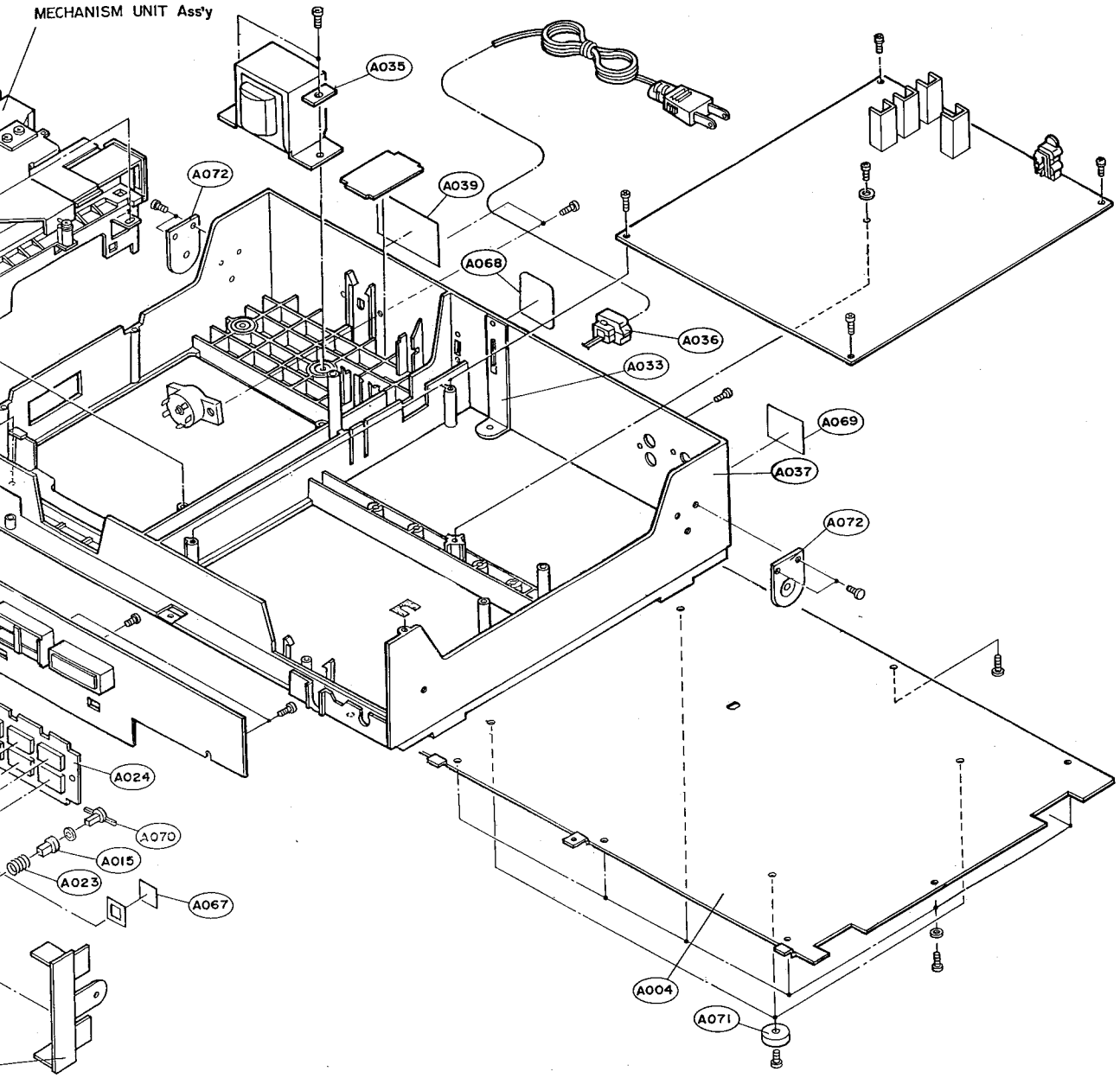
(FOR GENERAL (EW) MODEL)



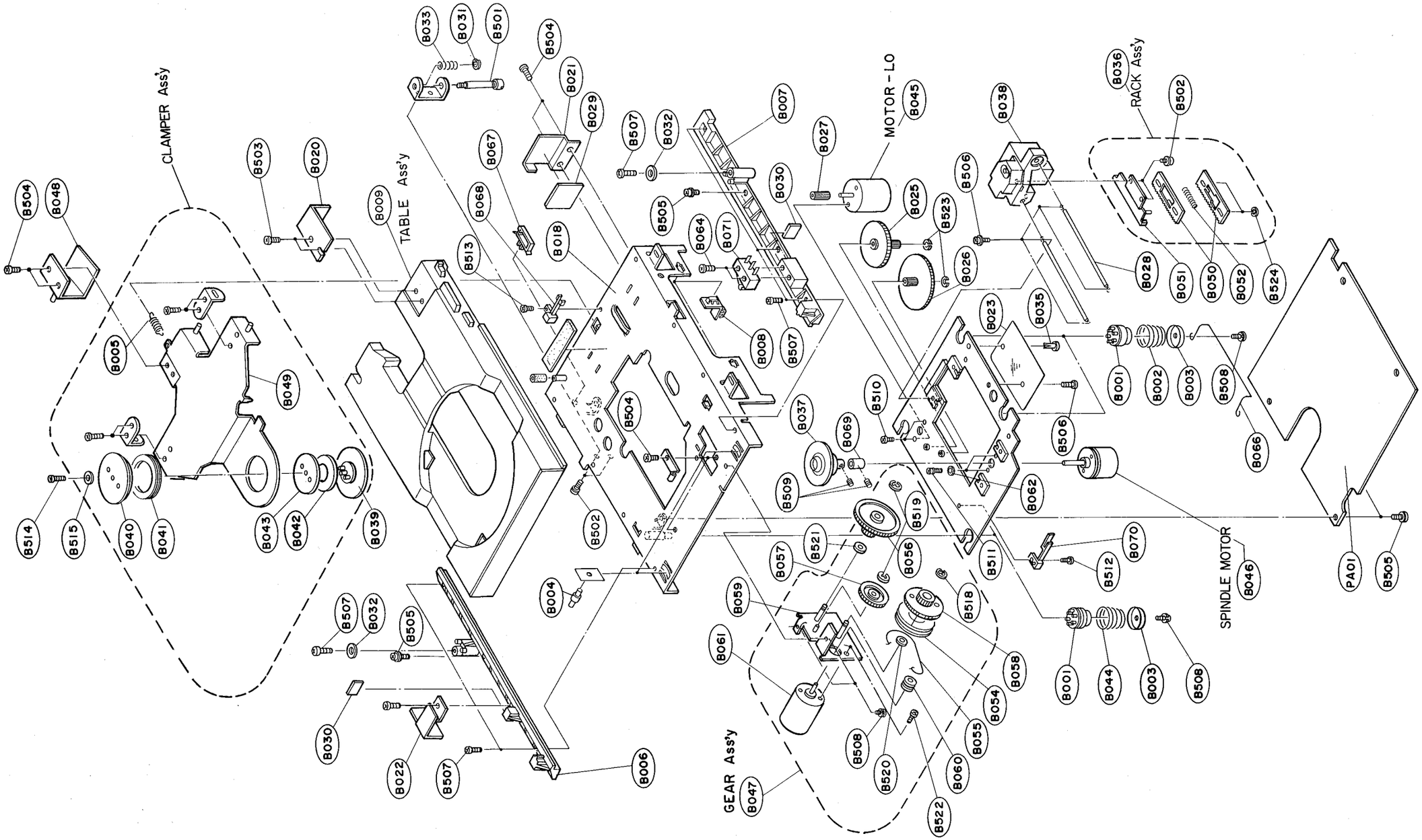
EXPLODED VIEW OF SET

(FOR GENERAL (EW) MODEL)

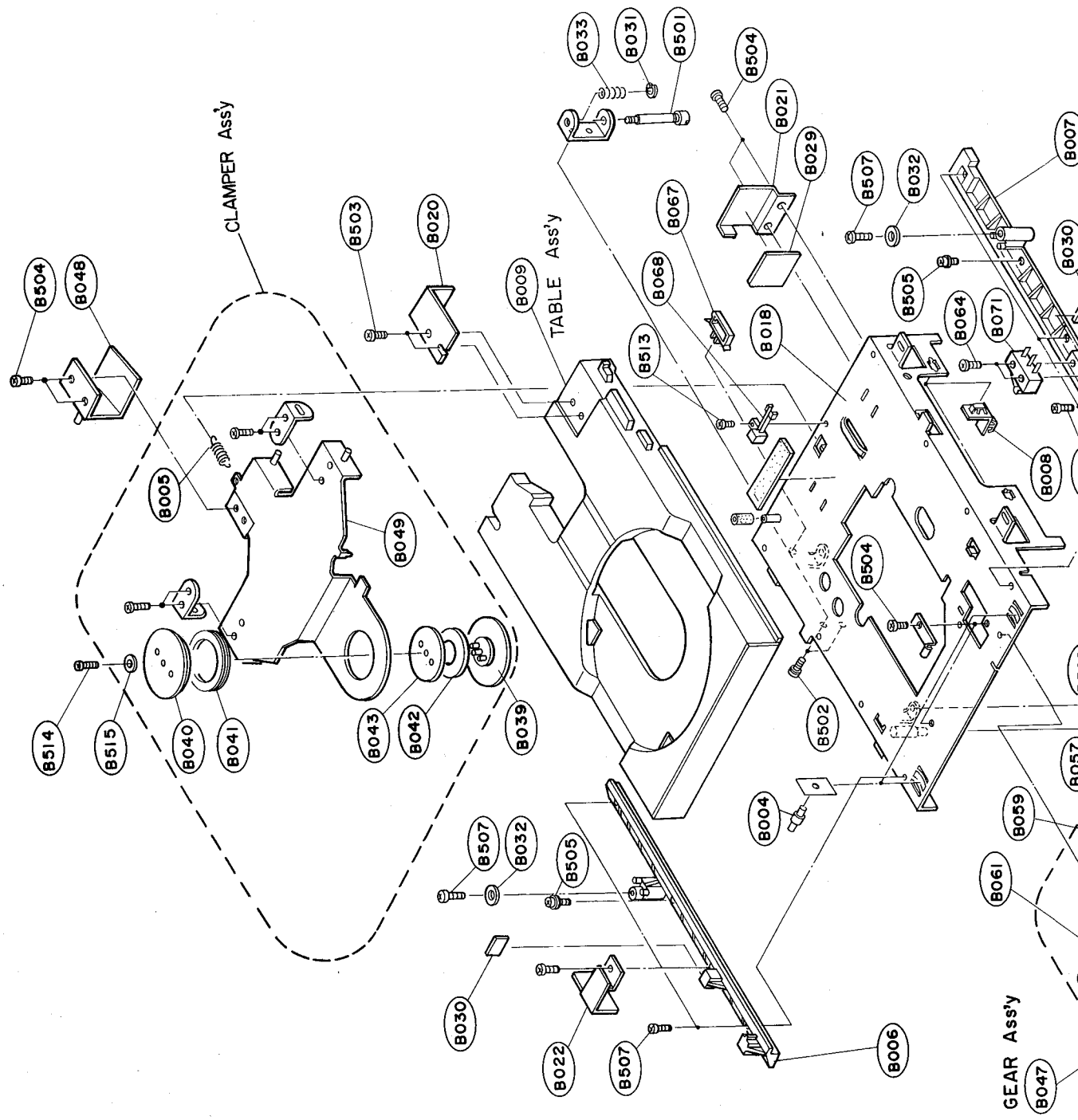


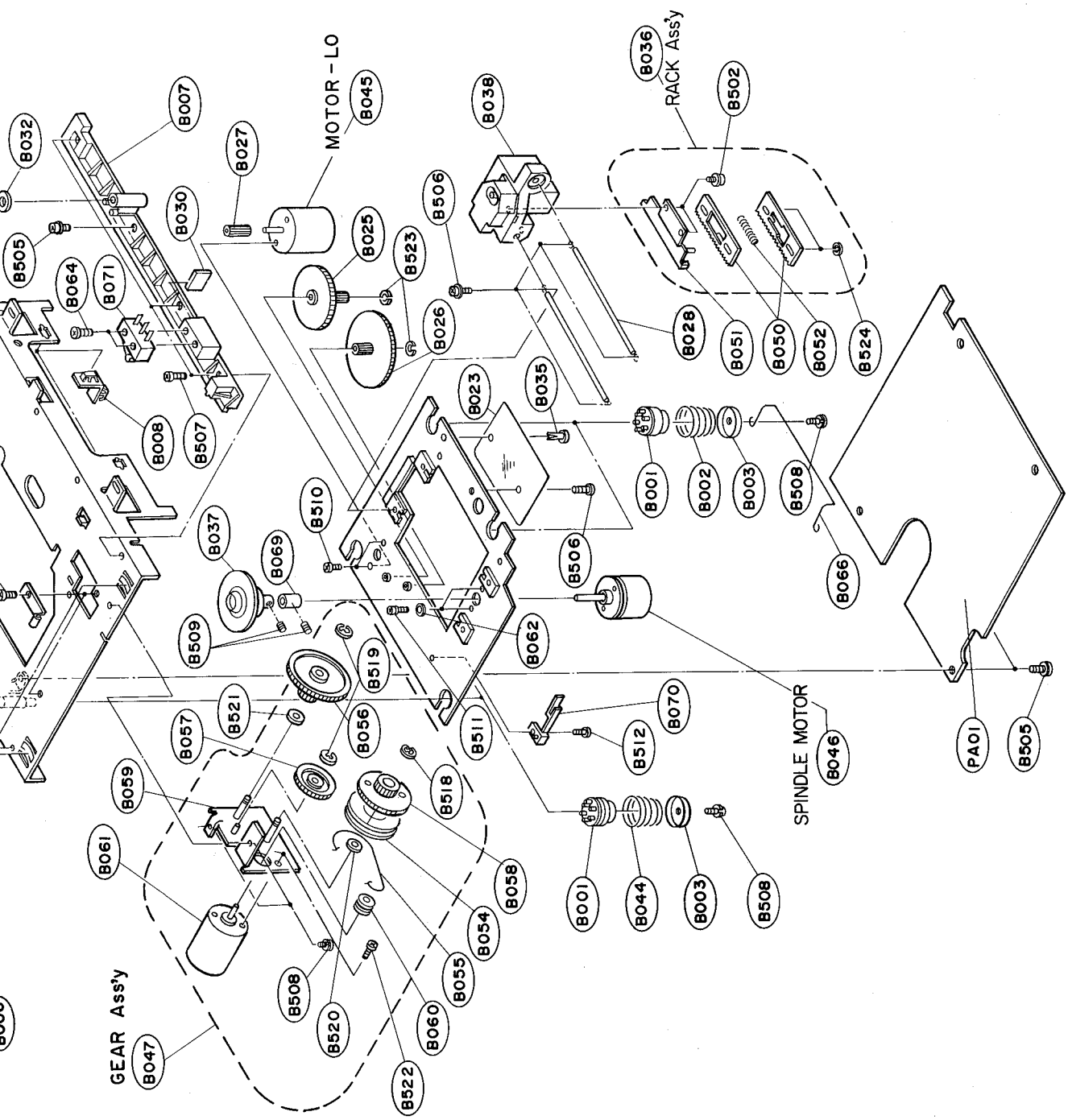

MECHANISM UNIT Ass'y
A035
A072
A039
A068
A036
A033
A069
A037
A072
A024
A070
A015
A023
A067
A004
A071

EXPLODED VIEW OF MECHANISM UNIT



EXPLODED VIEW OF MECHANISM UNIT




B032
B007
B027
MOTOR - LO
B045
B038
B036
RACK Ass'y
B502
B505
B030
B025
B506
B064
B071
B523
B026
B028
B051
B050
B052
B524
B008
B507
B023
B035
B001
B002
B003
B508
B510
B037
B069
B506
B066
B509
B062
B519
B521
B057
B056
B511
B070
B512
B059
B518
SPINDLE MOTOR
B046
PA01
B505
B061
B058
B001
B044
B003
B508
B054
B055
B508
B520
B060
GEAR Ass'y
B047
B522

REPLACEMENT PARTS LIST

(FOR USA MODEL)

Note: The components identified by ⚠ mark or with the symbol Nos. shaded are critical for safety. Replace only with parts Number specified.

HD500

SYMBOL			PARTS NO	DESCRIPTION	QTY
		*** ICS ***			
IC601			37101203	IC UPC1473HA	1
IC102	IC103	IC104	37101241	IC BA4558	5
IC105	IC106				
IC204	IC205	IC206	5652-M5218L	IC M5218L	4
IC701					
IC101			37903201	IC BA4560-D	1
IC304			37904033	MOS UPD4011BC(ESD)	1
IC201			37951041	IC MOS YM-3531(ESD)	1
IC203			37951042	IC MOS HM6116P-4(ESD)	1
IC202			37951044	IC MOS YM-2201FK(ESD)	1
IC301			37951047	IC PCM53JPV-2	1
IC401			37951048	IC MOS UPD7508HC-046(ESD)	1
IC402			37951049	IC MOS M50117P	1
IC302	IC303		37951109	IC HD14053BP	2
		*** TRANSISTORS ***			
TR107	TR112	TR207	35025517	TR/2SB744 Q	7
TR209	TR211	TR502			
TR504					
TR303	TR304	TR307	5611-999(F)	TR/2SA999F	4
TR308					
TR104	TR105	TR313	35904408	TR/2SA1175 H	15
TR317	TR401	TR601			
TR602	TR603	TR604			
TR605	TR606	TR607			
TR608	TR609	TR610			
TR101	TR102		5613-535(B)	TR 2SC535B	2
TR301	TR302	TR305	5613-2320(F)	TR 2SC2320F	8
TR306	TR309	TR310			
TR311	TR312				
TR103	TR108	TR109	35950908	TR/2SC2785 H	15
TR110	TR113	TR114			
TR115	TR116	TR118			
TR201	TR202	TR314			
TR315	TR316	TR402			
TR106	TR111	TR117	35962617	TR/2SD 794 Q	10
TR206	TR208	TR210			
TR501	TR503	TR505			
TR506					
		*** DIODES ***			
D101	D102	D103	5631-1S2473	DIODE/SI.1S2473	29
D104	D105	D106			
D107	D108	D201			

HD500

SYMBOL			PARTS NO	DESCRIPTION	QTY
D202	D203	D204	5631-1S2473	DIODE/SI.1S2473	29
D207	D208	D301			
D302	D303	D304			
D309	D310	D401			
D402	D403	D404			
D510	D603	D604			
D605	D606				
D209			36050024	DIODE BARICAP SVC-333	1
D607			36803003	DIODE/PHOTO PH302	1
D506			5632-1SR35-10	DIODE 1SR35-100/AT	1
⚠ D509			5635-RD5.6EB2	DIODE/ZENER RD5.6EB2(A)	1
⚠ D507	D508		5635-RD16EB1	DIODE/ZENER RD16EB1(A)/AT	2
⚠ D502			36902069	RECTIFIER BLOCK S1VB10	1
⚠ D501			36902111	RECTIFIER	1
D601			36904292	LED	1
D602			36904293	LED UNIT SEL 9603-04	1
D311			5635-HZ6A-1L	DIODE HZ6A-1L	1
D305	D306	D307	5635-HZ9A-1L	DIODE HZ9A-1L	4
D308					
⚠ D503	D504		5635-HZ16-1L	DIODE HZ16-1L	2
		*** TRANSFORMERS ***			
⚠			45006177	TRANS POWER	1
		*** VARIABLE RESISTORS ***			
VR701			41950535	VR/5KB	1
VR104			41951151	R/VARIABLE 33K/B	1
VR103			41951154	R/VARIABLE 100K/B	1
VR101			41951203	R/VARIABLE 33K	1
VR102			41951210	R/VARIABLE 470K	1
		*** RELAYS & SWITCHES ***			
S601	S602	S603	65904469	MOMENTARY SW	11
S604	S605	S606			
S607	S608	S609			
S610	S611				
B068			65907061	SWITCH	1
B070			65907081	SWITCH/LEAF	1
⚠			65911120	SW/LEVER/POWER SDL01P	1
		*** COILS & FILTERS ***			
L601			60980003	COIL/DETECTOR	1
L101			610E2074	COIL FILTER 100KA.AT	1
L201			61904473	VCO OSC COIL	1
CF402			61919077	CERAMIC FILTER 455K01	1

HD500

SYMBOL	PARTS NO	DESCRIPTION	QTY
CF401	61919078	CERALOCK 4MHZ	1
***	PCB ASSYS	***	
	87868501	MAIN PCB FULL ASSY	1
***	ELECTRICAL PARTS' & MISCELLANEOUS PARTS	***	
X201	64920183	XTAL 8.6436MHZ	1
⚠	70804014	POWER CORD (US)	1
P301	70905629	PIN JACK 2P	1
P702	70905648	JACK,HEAD PHONE	1
	71905211	TERMINAL,GROUND	1
B038	79710004	PICKUP KSS-121B	1
B045	79752083	MOTOR	1
B046	79752084	MOTOR	1
	79799202	COVER CAPACITOR	1
	79799290	REMOTE CONT.UNIT	1
***	APPEARANCE PARTS	***	
A071	18290731	FOOT,RUBBER (H9.0)	4
	18291091	CLAMPER,WIRE L94 WHITE	2
A036	18293241	WIRE CLAMPER #2271	1
B042	18293961	MAGNET B	1
A037	18301215	CHASSIS BASE (UL)	1
A001	18358541	CABINET	1
B036	18409593	RACK ASSY	1
B040	18409662	HOLDER,CATCH	1
B025	18409672	GEAR A	1
B026	18409681	GEAR B	1
B027	18409692	MOTOR PINION	1
B039	18410181	HOLDER MAGNET B	1
A024	18410281	BASE BUTTON	1
B047	18410381	LO GEAR ASSY (2)	1
B034	18530132	SPRING CENTER	1
B043	18532112	YOKE	1
B028	18532142	RAIL	2
B037	18533593	T.T BASE B ASSY	1
A023	18534031	SPRING,COIL	3
B048	18534071	BASE-CLAMPER ASSY	1
B049	18534092	CLAMPER ASSY	1
	18610291	PLATE	1
B041	18610611	RUBBER	1
A039	18721321	MODEL NO.PLATE	1
A005	18721331	ORNAMENTAL PLATE (H/K)	1
A080	88868641	PANEL FRONT S,ASSY	1
	18927501	CASE BATTERY	1

HD500

SYMBOL	PARTS NO	DESCRIPTION	QTY
***	KNOBS & PUSH BUTTONS	***	
A067	1660-00401	BUTTON POWER ASSY	1
A020	1662-21201VN	FUNC. BUTTON (L)	1
A021	1662-21101VN	FUNC. BUTTON (S)	6
A015	1662-05401VN	BUTTON PUSH	3
A070	2601-7149	SHAFT	3
A003	18477001	KNOB VR ASSY	1
A019	18477031	BUTTON EJECT (H/K)	1
***	PRINTED & PACKING MATERIALS	***	
	18813121	FILLER,CARTON	2
	18813521	CARTON BOX	1
	78924321	INSTRUCTION BOOKLET	1
***	MECHANICAL PARTS	***	
B018	18291091	CLAMPER,WIRE L94 WHITE	5
B008	18293681	PWB HINGE	2
B019	18293751	BUSH L100 UL	1
B009	18409522	TABLE ASSY	1
B006	18409613	GUIDE	1
B007	18409623	GUIDE	1
B004	18409872	ROLLER ASSY	4
B002	18532174	SPRING	3
B003	18532181	CATCH,CUTION	4
B033	18532231	SPRING	1
B044	18532283	SPRING	1
B501	18533031	SCREW B	1
B020	18533062	TABLE ROCK A	1
B021	18533071	TABLE ROCK B	1
B022	18533081	TABLE LIMITER	1
B005	18534101	SPRING	1
B001	18610093	CUSHION	4
B023	18610341	GUIDE READ	1
B029	18610421	MAGNET RUBBER	1
B030	18610431	STOPPER CUSHION	2
B031	18851081	E.WASHER DIA 4	1
B502	18852291	SCREW,SPECIAL	2
B035	24851801	RIVET,PUSH	1
PA01	87868101	SERVO PWB FULL ASSY	1

HD500

SYMBOL			PARTS NO	DESCRIPTION	QTY
		***	RESISTORS	***	
⚠ R1A1	R1A2	R260	5102-4R74713	R.FUSE.4.7H 1/4W 5%	6
R261	R262	R263			
R619			5134-150J25P	R/CARBON 15H 5% 1/4W	1
R141	R160	R622	5134-220J25P	R/CARBON 22H 5% 1/4W	3
R617	R618		5134-270J25P	R/CARBON 27H 5% 1/4W	2
R226	R307	R308	5134-470J25P	R/CARBON 47H 5% 1/4W	3
R121	R168	R201	5134-101J25P	R/CARBON 100H 5% 1/4W	6
R349	R350	R506			
R601	R602	R603	5134-181J25P	R/CARBON 180H 5% 1/4W	8
R604	R605	R606			
R607	R608				
R113			5134-221J25P	R/CARBON 220H 5% 1/4W	1
R110	R323	R324	5134-331J25P	R/CARBON 330H 5% 1/4W	9
R337	R338	R347			
R348	R389	R390			
R127	R209	R248	5134-471J25P	R/CARBON 470H 5% 1/4W	8
R264	R610	R612			
R614	R616				
R118			5134-561J25P	R/CARBON 560H 5% 1/4W	1
R179	R183	R319	5134-102J25P	R/CARBON 1.0K 5% 1/4W	6
R320	R374	R624			
R315	R316	R392	5134-122J25P	R/CARBON 1.2K 5% 1/4W	3
R111	R175	R181	5134-152J25P	R/CARBON 1.5K 5% 1/4W	7
R333	R334	R335			
R336					
R130			5134-162J25P	R/CARBON 1.6K 5% 1/4W	1
R176	R220	R246	5134-222J25P	R/CARBON 2.2K 5% 1/4W	3
R152			5134-272J25P	R/CARBON 2.7K 5% 1/4W	1
R117	R211	R223	5134-332J25P	R/CARBON 3.3K 5% 1/4W	6
R239	R313	R314			
R107	R108	R339	5134-392J25P	R/CARBON 3.9K 5% 1/4W	6
R340	R341	R342			
R124	R133	R137	5134-472J25P	R/CARBON 4.7K 5% 1/4W	16
R185	R186	R188			
R199	R208	R229			
R245	R317	R318			
R321	R322	R407			
R507					
R196	R391		5134-562J25P	R/CARBON 5.6K 5% 1/4W	2
R114	R115		5134-622J25P	R/CARBON 6.2K 5% 1/4W	2
R10C	R10D	R101	5134-682J25P	R/CARBON 6.8K 5% 1/4W	13
R109	R139	R214			
R216	R217	R301			
R325	R326	R327			
R328					
R329	R330	R331	5134-822J25P	R/CARBON 8.2K 5% 1/4W	4
R332					

HD500

SYMBOL			PARTS NO	DESCRIPTION	QTY
R10B	R102	R112	5134-103J25P	R/CARBON 10K 5% 1/4W	38
R119	R136	R142			
R144	R149	R163			
R165	R170	R171			
R173	R178	R189			
R194	R195	R202			
R227	R228	R241			
R242	R249	R250			
R367	R368	R383			
R384	R397	R404			
R406	R418	R609			
R611	R613	R615			
R701	R702				
R703	R704		5134-113J25P	R/CARBON 11K 5% 1/4W	2
R174			5134-123J25P	R/CARBON 12K 5% 1/4W	1
R177	R251	R252	5134-153J25P	R/CARBON 15K 5% 1/4W	5
R705	R706				
R129			5134-183J25P	R/CARBON 18K 5% 1/4W	1
R10A	R132	R134	5134-203J25P	R/CARBON 20K 5% 1/4W	8
R166	R167	R198			
R206	R207				
R125	R210	R218	5134-223J25P	R/CARBON 22K 5% 1/4W	8
R219	R221	R222			
R224	R238				
R105	R106	R161	5134-273J25P	R/CARBON 27K 5% 1/4W	3
R187	R386		5134-333J25P	R/CARBON 33K 5% 1/4W	2
R123	R151	R155	5134-393J25P	R/CARBON 39K 5% 1/4W	7
R158	R172	R190			
R191					
R116	R140	R148	5134-473J25P	R/CARBON 47K 5% 1/4W	11
R154	R162	R180			
R203	R237	R369			
R370	R410				
R143	R182		5134-563J25P	R/CARBON 56K 5% 1/4W	2
R234	R247		5134-683J25P	R/CARBON 68K 5% 1/4W	2
R138	R204	R385	5134-823J25P	R/CARBON 82K 5% 1/4W	3
R126	R135	R153	5134-104J25P	R/CARBON 100K 5% 1/4W	24
R164	R169	R193			
R205	R215	R230			
R231	R232	R235			
R371	R372	R388			
R401	R402	R403			
R405	R408	R414			
R415	R416	R417			
R145	R225		5134-124J25P	R/CARBON 120K 5% 1/4W	2
R122	R197	R244	5134-154J25P	R/CARBON 150K 5% 1/4W	5
R373	R621				
R258			5134-224J25P	R/CARBON 220K 5% 1/4W	1
R131			5134-244J25P	R/CARBON 240K 5% 1/4W	1
R243			5134-364J25P	R/CARBON 360K 5% 1/4W	1
R159			5134-394J25P	R/CARBON 390K 5% 1/4W	1

HD500

SYMBOL			PARTS NO	DESCRIPTION	QTY
R192			5134-474J25P	R/CARBON 470K 5% 1/4W	1
R146	R233	R236	5134-564J25P	R/CARBON 560K 5% 1/4W	3
R147			5134-824J25P	R/CARBON 820K 5% 1/4W	1
R156	R381	R382	5134-105J25P	R/CARBON 1.0M 5% 1/4W	3
R157			5134-115J25P	R/CARBON 1.1M 5% 1/4W	1
R150			5134-225J25P	R/CARBON 2.2M 5% 1/4W	1
R240			5102-1R5579	R,FUSE 1.5H5% 1/4W	1
R343	R344	R345	5102-4R74173	R,FUSE 4.7H 5% 1/4W	4
R346					
R365	R366		5102-1004173	R,FUSE 10H 5% 1/4W	2
R707	R708		5102-1814173	R,FUSE 180H 5% 1/4W	2
R623			5102-2214173	R,FUSE 220H 5% 1/4W	1
R501	R502	R503	5102-4714173	R,FUSE 470H 5% 1/4W	5
R504	R505				
R303	R304	R305	5102-6814173	R,FUSE 680H 5% 1/4W	5
R306	R387				
R508	R509		5102-1024173	R,FUSE 1.0K 5% 1/4W	2
R184			40933068	R/METAL 120H 5% 2W	1
		***	CAPACITORS	***	
C524			42019575	C/CERAMIC 500V 0.01UF	1
C102	C127	C131	5361-473ZF	C/CERAMIC 50V 0.047UF	11
C132	C133	C134			
C219	C234	C401			
C499	C602				
C226			5361-103ZF	C/CERAMIC 50V 0.01UF	1
C139	C140	C141	5361-473ZF	C/CERAMIC 50V 0.047UF	3
C113	C114		5361-100DSL	C/CERAMIC 50V 10PF	2
C110			5361-330KSL	C/CERAMIC 50V 33PF	1
C109	C116	C407	5361-101KSL	C/CERAMIC 50V 100PF	3
C408			5361-151KSL	C/CERAMIC 50V 150PF	1
C105	C106	C203	5361-391KSL	C/CERAMIC 50V 390PF	3
C402	C403		5361-330KSL	C.CERAMIC 50V 33PF	2
C217			5361-101KSL	C/CERAMIC 50V 100PF	1
C207	C218		5361-151KSL	C.CERAMIC 50V 150PF	2
C142			5361-151KSL	C/CERAMIC 50V 150PF	1
C225			5361-221KSL	C/CERAMIC 50V 220PF	1
C235	C236		5361-220KSL	C/CERAMIC 50V 22PF	2
C211			5353-221535	C/MICA 50V 220PF	1
C128	C129	C130	5361-223N913	C/CERAMIC 16V 0.022UF	6
C135	C136	C138			
C210	C521		5354-102J1HM	C/FILM 50V 1000PF 5%	2
C221	C222		5354-122J1HM	C/FILM 50V 1200PF 5%	2
C208			5354-152J1HM	C/FILM 50V 1500PF 5%	1
C220	C223		5354-222J1HM	C/FILM 50V 2200PF 5%	2
C201	C214	C606	5354-332J1HM	C/FILM 50V 3300PF 5%	3

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SYMBOL			PARTS NO	DESCRIPTION	QTY
C115			5354-822J1HM	C/FILM 50V 8200PF 5%	1
C118	C119	C202	5354-103J1HM	C/FILM 50V 0.010UF 5%	7
C212	C406	C603			
C610					
C107	C209		5354-223J1HM	C/FILM 50V 0.022UF 5%	2
C604			5354-333J1HM	C/FILM 50V 0.033UF 5%	1
C103	C206		5354-104J1HM	C/FILM 50V 0.10UF 5%	2
C1			42910036	C/CERAMIC 400V 4700PF	1
C108	C120		4297F729	C/FILM 50V 0.22 UF 5%	2
C117			4297F731	C/FILM 50V 0.33 UF 5%	1
C313	C314		5359-3315851	C/FILM 50V 330PF	2
C319	C320		5359-6815851	C/FILM 50V 680PF	2
C325	C326		5359-1025851	C/FILM 50V 1000PF	2
C309	C310		5359-3925851	C/FILM 50V 3900PF	2
C335	C336		5359-6825851	C/FILM 50V 6800PF	2
C311	C312		5359-5035851	C/FILM 50V 0.05UF	2
C522	C523		5354-104593	C/FILM 50V 0.1UF	2
C605	C608		5345-106C041	C/ELEC 16V 10UF	2
C607	C609		5345-476B041	C/ELEC 10V 47UF	2
C405			5345-476B041	C/ELEC 10V 47UF	1
C215	C299	C517	5345-227B041	C/ELEC 10V 220UF	4
C518					
C515	C516		5345-476D041	C/ELEC 25V 47UF	2
C101	C123	C137	5345-107D041	C/ELEC 25V 100UF	8
C213	C216	C227			
C228	C229				
C409			5345-474F041	C/ELEC 50V 0.47UF	1
C350			5345-335F041	C/ELEC 50V 3.3UF	1
C338	C404		5345-475F041	C/ELEC 50V 4.7UF	2
C104	C122	C204	5345-106F041	C/ELEC 50V 10UF	4
C339					
C303			5345-227A041	C/ELEC 6.3V 220UF	1
C305	C306	C307	5345-227B041	C/ELEC 10V 220UF	4
C308					
C321	C322	C323	5345-227C041	C/ELEC 16V 220UF	6
C324	C513	C514			
C301	C302		5345-477C041	C/ELEC 16V 470UF	2
C507	C508		5345-228C041	C/ELEC 16V 2200UF UTCS	2
C504	C505		5345-107D041	C/ELEC 25V 100UF	2
C501	C502		5345-228D041	C/ELEC 25V 2200UF	2
C205	C224		5342-105F0951	C/ELEC 50V 1UF	2
C121			5345-226D041	C/ELEC 25V 22UF	1
C111			5345-476C041	C/ELEC 16V 47UF	1
C112			5345-475D041	C/ELEC 25V 4.7UF	1
C126			5345-105F041	C/ELEC 50V 1UF	1
C519	C601		5345-477A041	C/ELEC 6.3V 470UF	2
C511	C512		5345-108B041	C/ELEC 10V 1000UF	2

SYMBOL			PARTS NO	DESCRIPTION	QTY
C124	C125	C337	5134-227C041	C,ELEC 16V 220UF	5
C701	C702				
C506	C509	C510	5134-108C041	C,ELEC 16V 1000UF	3
C503			5134-228C041	C,ELEC 16V 2200UF	1
C230	C231		5134-227E041	C,ELEC 35V 220UF	2
C238			5134-335F041	C,ELEC 50V 3.3UF	1
C315	C316	C317	5134-476C041	C,ELEC 16V 47UF	8
C318	C327	C328			
C329	C330				

REPLACEMENT PARTS LIST

(FOR CANADA (A) MODEL)

Note: The components identified by ⚠ mark or with the symbol Nos. shaded are critical for safety. Replace only with parts Number specified.

HD500 (A)

SYMBOL			PARTS NO	DESCRIPTION	QTY
		*** ICS ***			
IC601			37101203	IC UPC1473HA	1
IC102	IC103	IC104	37101241	IC BA4558	5
IC105	IC106				
IC204	IC205	IC206	5652-M5218L	IC M5218L	4
IC701					
IC101			37903201	IC BA4560-D	1
IC304			37904033	MOS UPD4011BC(ESD)	1
IC201			37951041	IC MOS YM-3531(ESD)	1
IC203			37951042	IC MOS HM6116P-4(ESD)	1
IC202			37951044	IC MOS YM-2201FK(ESD)	1
IC301			37951047	IC PCM53JPV-2	1
IC401			37951048	IC MOS UPD7508HC-046(ESD)	1
IC402			37951049	IC MOS M50117P	1
IC302	IC303		37951109	IC HD14053BP	2
		*** TRANSISTORS ***			
TR107	TR112	TR207	35025517	TR,2SB744 Q	7
TR209	TR211	TR502			
TR504					
TR303	TR304	TR307	5611-999(F)	TR,2SA999F	4
TR308					
TR104	TR105	TR313	35904408	TR,2SA1175 H	15
TR317	TR401	TR601			
TR602	TR603	TR604			
TR605	TR606	TR607			
TR608	TR609	TR610			
TR101	TR102		5613-535(B)	TR 2SC535B	2
TR301	TR302	TR305	5613-2320(F)	TR 2SC2320F	8
TR306	TR309	TR310			
TR311	TR312				
TR103	TR108	TR109	35950908	TR,2SC2785 H	15
TR110	TR113	TR114			
TR115	TR116	TR118			
TR201	TR202	TR314			
TR315	TR316	TR402			
TR106	TR111	TR117	35962617	TR,2SD 794 Q	10
TR206	TR208	TR210			
TR501	TR503	TR505			
TR506					
		*** DIODES ***			
D101	D102	D103	5631-1S2473	DIODE,SI.1S2473	29
D104	D105	D106			
D107	D108	D201			

HD500 (A)

SYMBOL			PARTS NO	DESCRIPTION	QTY
D202	D203	D204	5631-1S2473	DIODE,SI.1S2473	29
D207	D208	D301			
D302	D303	D304			
D309	D310	D401			
D402	D403	D404			
D510	D603	D604			
D605	D606				
D209			36050024	DIODE BARICAP SVC-333	1
D607			36803003	DIODE,PHOTO PH302	1
⚠ D506			5632-1SR35-10	DIODE 1SR35-100,AT	1
⚠ D509			5635-RD5R6EB2	DIODE,ZENER RD5.6EB2(A)	1
⚠ D507	D508		5635-RD16EB1	DIODE,ZENER RD16EB1(A),AT	2
⚠ D502			36902066	RECTIFIER BLOCK S1VB10	1
⚠ D501			36902111	RECTIFIER	1
D601			36904292	LED	1
D602			36904293	LED UNIT SEL 9603-04	1
D311			5635-HZ6A-1L	DIODE HZ6A-1L	1
D305	D306	D307	5635-HZ9A-1L	DIODE HZ9A-1L	4
D308					
⚠ D503	D504		5635-HZ16-1L	DIODE HZ16-1L	2
		*** TRANSFORMERS ***			
⚠			45006177	TRANS POWER	1
		*** VARIABLE RESISTORS ***			
VR701			41950535	VR,5KB	1
VR104			41951151	R,VARIABLE 33K,B	1
VR103			41951154	R,VARIABLE 100K,B	1
VR101			41951203	R,VARIABLE 33K	1
VR102			41951210	R,VARIABLE 470K	1
		*** RELAYS & SWITCHES ***			
S601	S602	S603	65904469	MOMENTARY SW	11
S604	S605	S606			
S607	S608	S609			
S610	S611				
B068			65907061	SWITCH	1
B070			65907081	SWITCH,LEAF	1
			65911120	SW,LEVER,POWER SDL01P	1
		*** COILS & FILTERS ***			
L601			60980003	COIL,DETECTOR	1
L101			61002074	COIL FILTER 100KA.AT	1
L201			61904473	VCO OSC COIL	1
CF402			61919077	CERAMIC FILTER 455K01	1

HD500 (A)

SYMBOL	PARTS NO	DESCRIPTION	QTY
CF401	61919078	CERALOCK 4MHZ	1
	*** PCB ASSYS ***		
	87868501	MAIN PCB FULL ASSY	1
	*** ELECTRICAL PARTS & MISCELLANEOUS PARTS ***		***
X201	64920183	XTAL 8.6436MHZ	1
⚠	70604014	POWER CORD (US)	1
P301	70905629	PIN JACK 2P	1
P702	70905648	JACK,HEAD PHONE	1
	71905211	TERMINAL,GROUND	1
B038	79710004	PICKUP KSS-121B	1
B045	79752083	MOTOR	1
B046	79752084	MOTOR	1
	79799202	COVER CAPACITOR	1
	79799290	REMOTE CONT.UNIT	1
	*** APPEARANCE PARTS ***		
A071	18290731	FOOT,RUBBER (H9.0)	4
	18291091	CLAMPER,WIRE L94 WHITE	1
A036	18293241	WIRE CLAMPER #2271	1
B042	18293961	MAGNET B	1
A037	18301215	CHASSIS BASE (UL)	1
A001	18358541	CABINET	1
B036	18409593	RACK ASSY	1
B040	18409662	HOLDER,CATCH	1
B025	18409672	GEAR A	1
B026	18409681	GEAR B	1
B027	18409692	MOTOR PINION	1
B039	18410181	HOLDER MAGNET B	1
A024	18410281	BASE BUTTON	1
B047	18410381	LO GEAR ASSY (2)	1
B034	18530132	SPRING CENTER	1
B043	18532112	YOKE	1
B028	18532142	RAIL	2
B037	18533593	T.T BASE B ASSY	1
A023	18534031	SPRING,COIL	3
B048	18534071	BASE-CLAMPER ASSY	1
B049	18534092	CLAMPER ASSY	1
	18610291	PLATE	1
B041	18610611	RUBBER	1
A039	18721321	MODEL NO.PLATE	1
A005	18721331	ORNAMENTAL PLATE (H/K)	1
A080	88868641	PANEL FRONT S,ASSY	1
	18927501	CASE BATTERY	1

HD500 (A)

SYMBOL	PARTS NO	DESCRIPTION	QTY
	*** KNOBS & PUSH BUTTONS ***		
A067	1660-00401	BUTTON POWER ASSY	1
A020	1662-21201VN	FUNC. BUTTON (L)	1
A021	1662-21101VN	FUNC. BUTTON (S)	6
A015	1662-05401VN	BUTTON PUSH	3
A070	2601-7149	SHAFT	3
A003	18477001	KNOB VR ASSY	1
A019	18477031	BUTTON EJECT (H/K)	1
	*** PRINTED & PACKING MATERIALS ***		
	18813521	CARTON BOX	1
	78924351	INSTRUCTION BOOKLET	1
	*** MECHANICAL PARTS ***		
B018	18291091	CLAMPER,WIRE L94 WHITE	5
B008	18293681	PWB HINGE	2
B019	18293751	BUSH L100 UL	1
B009	18409522	TABLE ASSY	1
B006	18409613	GUIDE	1
B007	18409623	GUIDE	1
B004	18409872	ROLLER ASSY	4
B002	18532174	SPRING	3
B003	18532181	CATCH,CUTION	4
B033	18532231	SPRING	1
B044	18532283	SPRING	1
B501	18533031	SCREW B	1
B020	18533062	TABLE ROCK A	1
B021	18533071	TABLE ROCK B	1
B022	18533081	TABLE LIMITER	1
B005	18534101	SPRING	1
B001	18610093	CUSHION	4
B023	18610341	GUIDE READ	1
B029	18610421	MAGNET RUBBER	1
B030	18610431	STOPPER CUSHION	2
B031	18851081	E.WASHER DIA 4	1
B502	18852291	SCREW,SPECIAL	2
B035	24851801	RIVET,PUSH	1
PA01	87868101	SERVO PWB FULL ASSY	1
	*** RESISTORS ***		
⚠ R1A1 R1A2 R19A R19B	5102-4R74713	R.FUSE,4.7H 1/4W 5%	4

HD500 (A)

SYMBOL			PARTS NO	DESCRIPTION	QTY
R619			5134-150J25P	R,CARBON 15H 5% 1/4W	1
R141	R160	R622	5134-220J25P	R,CARBON 22H 5% 1/4W	3
R617	R618		5134-270J25P	R,CARBON 27H 5% 1/4W	2
R226	R307	R308	5134-470J25P	R,CARBON 47H 5% 1/4W	3
R121	P168	R201	5134-101J25P	R,CARBON 100H 5% 1/4W	6
R349	R350	R506			
R601	R602	R603	5134-181J25P	R,CARBON 180H 5% 1/4W	8
R604	R605	R606			
R607	R608				
R113			5102-2214713	R,FUSE 220H 5% 1/4W	1
R110	R323	R324	5134-331J25P	R,CARBON 330H 5% 1/4W	9
R337	R338	R347			
R348	R389	R390			
R127	R209	R248	5134-471J25P	R,CARBON 470H 5% 1/4W	7
R610	R612	R614			
R616					
R118			5134-561J25P	R,CARBON 560H 5% 1/4W	1
R179	R183	R319	5134-102J25P	R,CARBON 1.0K 5% 1/4W	6
R320	R374	R624			
R315	R316	R392	5134-122J25P	R,CARBON 1.2K 5% 1/4W	3
R111	R175	R181	5134-152J25P	R,CARBON 1.5K 5% 1/4W	7
R333	R334	R335			
R336					
R130			5134-162J25P	R,CARBON 1.6K 5% 1/4W	1
R176	R220	R246	5134-222J25P	R,CARBON 2.2K 5% 1/4W	3
R152			5134-272J25P	R,CARBON 2.7K 5% 1/4W	1
R117	R211	R223	5134-332J25P	R,CARBON 3.3K 5% 1/4W	6
R239	R313	R314			
R107	R108	R339	5134-392J25P	R,CARBON 3.9K 5% 1/4W	6
R340	R341	R342			
R124	R133	R137	5134-472J25P	R,CARBON 4.7K 5% 1/4W	16
R185	R186	R188			
R199	R208	R229			
R245	R317	R318			
R321	R322	R407			
R507					
R196	R391		5134-562J25P	R,CARBON 5.6K 5% 1/4W	2
R114	R115		5134-622J25P	R,CARBON 6.2K 5% 1/4W	2
R100	R100	R101	5134-682J25P	R,CARBON 6.8K 5% 1/4W	13
R109	R139	R214			
R216	R217	R301			
R325	R326	R327			
R328					
R329	R330	R331	5134-822J25P	R,CARBON 8.2K 5% 1/4W	4
R332					
R108	R102	R112	5134-103J25P	R,CARBON 10K 5% 1/4W	38
R119	R136	R142			
R144	R149	R163			
R165	R170	R171			
R173	R178	R189			
R194	R195	R202			

HD500 (A)

SYMBOL			PARTS NO	DESCRIPTION	QTY
R227	R228	R241	5134-103J25P	R,CARBON 10K 5% 1/4W	38
R242	R249	R250			
R367	R368	R383			
R384	R397	R404			
R406	R418	R609			
R611	R613	R615			
R701	R702				
R703	R704		5134-113J25P	R,CARBON 11K 5% 1/4W	2
R174			5134-123J25P	R,CARBON 12K 5% 1/4W	1
R177	R251	R252	5134-153J25P	R,CARBON 15K 5% 1/4W	5
R705	R706				
R129			5134-183J25P	R,CARBON 18K 5% 1/4W	1
R10A	R132	R134	5134-203J25P	R,CARBON 20K 5% 1/4W	8
R166	R167	R198			
R206	R207				
R125	R210	R218	5134-223J25P	R,CARBON 22K 5% 1/4W	8
R219	R221	R222			
R224	R238				
R105	R106	R161	5134-273J25P	R,CARBON 27K 5% 1/4W	3
R187	R386		5134-333J25P	R,CARBON 33K 5% 1/4W	2
R123	R151	R155	5134-393J25P	R,CARBON 39K 5% 1/4W	7
R158	R172	R190			
R191					
R116	R140	R148	5134-473J25P	R,CARBON 47K 5% 1/4W	11
R154	R162	R180			
R203	R237	R369			
R370	R410				
R143	R182		5134-563J25P	R,CARBON 56K 5% 1/4W	2
R234	R247		5134-683J25P	R,CARBON 68K 5% 1/4W	2
R138	R204	R385	5134-823J25P	R,CARBON 82K 5% 1/4W	3
R126	R135	R153	5134-104J25P	R,CARBON 100K 5% 1/4W	24
R164	R169	R193			
R205	R215	R230			
R231	R232	R235			
R371	R372	R388			
R401	R402	R403			
R405	R408	R414			
R415	R416	R417			
R145	R225		5134-124J25P	R,CARBON 120K 5% 1/4W	2
R122	R197	R244	5134-154J25P	R,CARBON 150K 5% 1/4W	5
R373	R621				
R258			5134-224J25P	R,CARBON 220K 5% 1/4W	1
R131			5134-244J25P	R,CARBON 240K 5% 1/4W	1
R243			5134-364J25P	R,CARBON 360K 5% 1/4W	1
R159			5134-394J25P	R,CARBON 390K 5% 1/4W	1
R192			5134-474J25P	R,CARBON 470K 5% 1/4W	1
R146	R233	R236	5134-564J25P	R,CARBON 560K 5% 1/4W	3
R147			5134-824J25P	R,CARBON 820K 5% 1/4W	1
R156	R381	R382	5134-105J25P	R,CARBON 1.0M 5% 1/4W	3
R157			5134-115J25P	R,CARBON 1.1M 5% 1/4W	1
R150			5134-225J25P	R,CARBON 2.2M 5% 1/4W	1
R240			5102-1R5579	R,FUSE 1.5H 5% 1/4W	1
R343	R344	R345	5102-4R74713	R,FUSE 4.7H 5% 1/4W	4
R346					
R365	R366		5102-1004713	R,FUSE 10H 5% 1/4W	2

HD500 (A)

SYMBOL			PARTS NO	DESCRIPTION	QTY
R707	R708		5102-1814713	R,FUSE 180H 5% 1/4W	2
R623			5102-2214713	R,FUSE 220H 5% 1/4W	1
R501	R502	R503	5102-4714713	R,FUSE 470H 5% 1/4W	5
R504	R505				
R303	R304	R305	5102-6814713	R,FUSE 680H 5% 1/4W	5
R306	R387				
R508	R509		5102-1024713	R,FUSE 1.0K 5% 1/4W	2
R184			40933068	R/METAL 120H 5% 2W	1
		***	CAPACITORS	***	
C524			42019575	C/CERAMIC 500V 0.01UF	1
C102	C127	C131	5361-473ZF	C/CERAMIC 50V 0.047UF	11
C132	C133	C134			
C219	C234	C401			
C499	C602				
C226			5361-103ZF	C/CERAMIC 50V 0.01UF	1
C139	C140	C141	5361-473ZF	C/CERAMIC 50V 0.047UF	3
C113	C114		5361-100DSL	C/CERAMIC 50V 10PF	2
C110			5361-330KSL	C/CERAMIC 50V 33PF	1
C109	C116	C407	5361-101KSL	C/CERAMIC 50V 100PF	3
C408			5361-151KSL	C/CERAMIC 50V 150PF	1
C105	C106	C203	5361-391KSL	C/CERAMIC 50V 390PF	3
C402	C403		5361-330KSL	C.CERAMIC 50V 33PF	2
C217			5361-101JCH	C/CERAMIC 50V 100PF	1
C207	C218		5361-151JCH	C.CERAMIC 50V 150PF	2
C142			5361-151KSL	C/CERAMIC 50V 150PF	1
C225			5361-221KSL	C/CERAMIC 50V 220PF	1
C235	C236		5361-220JCH	C/CERAMIC 50V 22PF	2
C211			5353-221535	C/MICA 50V 220PF	1
C128	C129	C130	5361-223N913	C/CERAMIC 16V 0.022UF	6
C135	C136	C138			
C210	C521		5354-102J1HM	C/FILM 50V 1000PF 5%	2
C221	C222		5354-122J1HM	C/FILM 50V 1200PF 5%	2
C208			5354-152J1HM	C/FILM 50V 1500PF 5%	1
C220	C223		5354-222J1HM	C/FILM 50V 2200PF 5%	2
C201	C214	C606	5354-332J1HM	C/FILM 50V 3300PF 5%	3
C115			5354-822J1HM	C/FILM 50V 8200PF 5%	1
C118	C119	C202	5354-104J1HM	C/FILM 50V 0.010UF 5%	7
C212	C406	C603			
C610					
C107	C209		5354-223J1HM	C/FILM 50V 0.022UF 5%	2
C604			5354-333J1HM	C/FILM 50V 0.033UF 5%	1
C103	C206		5354-104J1HM	C/FILM 50V 0.10UF 5%	2
C1			42910036	C/CERAMIC 400V 4700PF	1
C108	C120		4297F729	C/FILM 50V 0.22 UF 5%	2
C117			4297F731	C/FILM 50V 0.33 UF 5%	1
C313	C314		5359-3315851	C/FILM 50V 330PF	2

HD500 (A)

SYMBOL			PARTS NO	DESCRIPTION	QTY
C319	C320		5359-6815851	C/FILM 50V 680PF	2
C325	C326		5359-1025851	C/FILM 50V 1000PF	2
C309	C310		5359-3925851	C/FILM 50V 3900PF	2
C335	C336		5359-6825851	C/FILM 50V 6800PF	2
C311	C312		5859-5035851	C/FILM 50V 0.05UF	2
C522	C523		5354-104593	C/FILM 50V 0.1UF	2
C605	C608		5345-106C041	C/ELEC 16V 10UF	2
C607	C609		5345-476B041	C/ELEC 10V 47UF	2
C405			5345-476B041	C/ELEC 10V 47UF	1
C215	C299	C517	5345-227B041	C/ELEC 10V 220UF	4
C518					
C515	C516		5345-476D041	C/ELEC 25V 47UF	2
C101	C123	C137	5345-107D041	C/ELEC 25V 100UF	8
C213	C216	C227			
C228	C229				
C409			5345-474F041	C/ELEC 50V 0.47UF	1
C350			5345-335F041	C/ELEC 50V 3.3UF	1
C338	C404		5345-475F041	C/ELEC 50V 4.7UF	2
C104	C122	C204	5345-106F041	C/ELEC 50V 10UF	4
C339					
C303			5345-227A041	C/ELEC 6.3V 220UF	1
C305	C306	C307	5345-227B041	C/ELEC 10V 220UF	4
C308					
C321	C322	C323	5345-227C041	C/ELEC 16V 220UF	6
C324	C513	C514			
C301	C302		5345-477C041	C/ELEC 16V 470UF	2
C507	C508		5345-228C041	C/ELEC 16V 2200UF UTCS	2
C504	C505		5345-107D041	C/ELEC 25V 100UF	2
C501	C502		5345-228D041	C/ELEC 25V 2200UF	2
C205	C224		5342-105F0951	C/ELEC 50V 1UF	2
C121			5345-226D041	C/ELEC 25V 22UF	1
C111			5345-476C041	C/ELEC 16V 47UF	1
C112			5345-475D041	C/ELEC 25V 4.7UF	1
C126			5345-105F041	C/ELEC 50V 1UF	1
C519	C601		5345-477A041	C/ELEC 6.3V 470UF	2
C511	C512		5345-108B041	C/ELEC 10V 1000UF	2
C124	C125	C337	5134-227C041	C/ELEC 16V 220UF	5
C701	C702				
C506	C509	C510	5134-108C041	C/ELEC 16V 1000UF	3
C503			5134-228C041	C/ELEC 16V 2200UF	1
C230	C231		5134-227E041	C/ELEC 35V 220UF	2
C238			5345-335F041	C/ELEC 50V 3.3UF	1
C315	C316	C317	5345-476C0951	C/ELEC 16V 47UF	8
C318	C327	C328			
C329	C330				

REPLACEMENT PARTS LIST

(FOR GENERAL (EW) MODEL)

Note: The components identified by ⚠ mark or with the symbol Nos. shaded are critical for safety. Replace only with parts Number specified.

HD500 (EW)

SYMBOL			PARTS NO	DESCRIPTION	QTY
			*** ICS ***		
IC601			37101203	IC UPC1473HA	1
IC102	IC103	IC104	37101241	IC BA4558	5
IC105	IC106				
IC204	IC205	IC206	5652-M5218L	IC M5218L	4
IC701					
IC101			37903201	IC BA4560-D	1
IC304			37904033	MOS UPD4011BC(ESD)	1
IC201			37951041	IC MOS YM-3531(ESD)	1
IC203			37951042	IC MOS HM6116P-4(ESD)	1
IC202			37951044	IC MOS YM-2201FK(ESD)	1
IC301			37951047	IC PCM53JPV-2	1
IC401			37951048	IC MOS UPD7508HC-046(ESD)	1
IC402			37951049	IC MOS M50117P	1
IC302	IC303		37951109	IC HD14053BP	2
			*** TRANSISTORS ***		
TR107	TR112	TR207	35025517	TR,2SB744 Q	7
TR209	TR211	TR502			
TR504					
TR303	TR304	TR307	5611-999(F)	TR,2SA999F	4
TR308					
TR104	TR105	TR313	35904408	TR,2SA1175 H	15
TR317	TR401	TR601			
TR602	TR603	TR604			
TR605	TR606	TR607			
TR608	TR609	TR610			
TR101	TR102		5613-535(B)	TR 2SC535B	2
TR301	TR302	TR305	5613-2320(F)	TR 2SC2320F	8
TR306	TR309	TR310			
TR311	TR312				
TR103	TR108	TR109	35950908	TR,2SC2785 H	15
TR110	TR113	TR114			
TR115	TR116	TR118			
TR201	TR202	TR314			
TR315	TR316	TR402			
TR106	TR111	TR117	35962617	TR,2SD 794 Q	10
TR206	TR208	TR210			
TR501	TR503	TR505			
TR506					
			*** DIODES ***		
D101	D102	D103	5631-1S2473	DIODE,SI.1S2473	29
D104	D105	D106			
D107	D108	D201			

HD500 (EW)

SYMBOL			PARTS NO	DESCRIPTION	QTY
D202	D203	D204	5631-1S2473	DIODE,SI.1S2473	29
D207	D208	D301			
D302	D303	D304			
D309	D310	D401			
D402	D403	D404			
D510	D603	D604			
D605	D606				
D209			36050024,	DIODE BARICAP SVC-333	1
D607			36803003	DIODE,PHOTO PH302	1
⚠D506			5632-1SR35-100	DIODE 1SR35-100,AT	1
⚠D509			5635-RD5R6EB2	DIODE,ZENER RD5.6EB2(A)	1
⚠D507	D508		5635-RD16EB1	DIODE,ZENER RD16EB1(A),AT	2
⚠D502			36902089	RECTIFIER BLOCK S1VB10	1
⚠D501			36902111	RECTIFIER	1
D601			36904292	LED	1
D602			36904293	LED UNIT SEL 9603-04	1
D311			5635-HZ6A-1L	DIODE HZ6A-1L	1
D305	D306	D307	5635-HZ9A-1L	DIODE HZ9A-1L	4
D308					
⚠D503	D504		5635-HZ16-1L	DIODE HZ16-1L	2
			*** TRANSFORMERS ***		
⚠T1			45019208	TRANS, POWER	1
			*** VARIABLE RESISTORS ***		
VR701			41950535	VR,5KB	1
VR104			41951151	R,VARIABLE 33K,B	1
VR103			41951154	R,VARIABLE 100K,B	1
VR101			41951203	R,VARIABLE 33K	1
VR102			41951210	R,VARIABLE 470K	1
			*** RELAYS & SWITCHES ***		
			65901065	VOLTAGE SELECTOR	1
S601	S602	S603	65904469	MOMENTARY SW	11
S604	S605	S606			
S607	S608	S609			
S610	S611				
B068			65907061	SWITCH	1
⚠B070			65907081	SWITCH,LEAF	1
			65911120	SW,LEVER,POWER SDL01P	1
			*** COILS & FILTERS ***		
L601			60980003	COIL,DETECTOR	1
L101			610E2074	COIL FILTER 100KA.AT	1
L201			61904473	VCO OSC COIL	1

HD500 (EW)

SYMBOL	PARTS NO	DESCRIPTION	QTY
CF402	61919077	CERAMIC FILTER 455K01	1
CF401	61919078	CERALOCK 4MHZ	1
	*** PCB ASSYS ***		
	87868501	MAIN PCB FULL ASSY	1
	*** ELECTRICAL PARTS & MISCELLANEOUS PARTS ***		***
X201	64920183	XTAL 8.6436MHZ	1
P301	70905629	PIN JACK 2P	1
P702	70905648	JACK,HEAD PHONE	1
	71905211	TERMINAL,GROUND	1
B038	79710004	PICKUP KSS-121B	1
⚠	79759186	POWER CORD	
B045	79752083	MOTOR	1
B046	79752084	MOTOR	1
	79799202	COVER CAPACITOR	1
	79799290	REMOTE CONT.UNIT	1
	*** APPEARANCE PARTS ***		
A071	18290731	FOOT,RUBBER (H9.0)	4
	18291091	CLAMPER,WIRE L94 WHITE	2
A036	18292501	CLAMPER WIRE	1
B042	18293961	MAGNET B	1
A037	18301215	CHASSIS BASE (UL)	1
A001	18358541	CABINET	1
B036	18409593	RACK ASSY	1
B040	18409662	HOLDER,CATCH	1
B025	18409672	GEAR A	1
B026	18409681	GEAR B	1
B027	18409692	MOTOR PINION	1
B039	18410181	HOLDER MAGNET B	1
A024	18410281	BASE BUTTON	1
B047	18410381	LO GEAR ASSY (2)	1
B034	18530132	SPRING CENTER	1
B043	18532112	YOKE	1
B028	18532142	RAIL	2
B037	18533593	T.T BASE B ASSY	1
A023	18534031	SPRING,COIL	3
B048	18534071	BASE-CLAMPER ASSY	1
B049	18534092	CLAMPER ASSY	1
B041	18610611	RUBBER	1
A005	18721331	ORNAMENTAL PLATE (H/K)	1
A080	88868641	PANEL FRONT S,ASSY	1
	18927501	CASE BATTERY	1

HD500 (EW)

SYMBOL	PARTS NO	DESCRIPTION	QTY
	*** KNOBS & PUSH BUTTONS ***		
A067	1660-00401	BUTTON POWER ASSY	1
A020	1662-21201VN	FUNC. BUTTON (L)	1
A021	1662-21101VN	FUNC. BUTTON (S)	6
A015	1662-05401VN	BUTTON PUSH	3
A070	2601-7149	SHAFT	3
A003	18477001	KNOB VR ASSY	1
A019	18477031	BUTTON EJECT (H/K)	1
	*** PRINTED & PACKING MATERIALS ***		
	18813521	CARTON BOX	1
	78924351	INSTRUCTION BOOKLET	1
	*** MECHANICAL PARTS ***		
B018	18291091	CLAMPER,WIRE L94 WHITE	5
B008	18293681	PWB HINGE	2
B019	18293751	BUSH L100 UL	1
B009	18409522	TABLE ASSY	1
B006	18409613	GUIDE	1
B007	18409623	GUIDE	1
B004	18409872	ROLLER ASSY	4
B002	18532174	SPRING	3
B003	18532181	CATCH,CUTION	4
B033	18532231	SPRING	1
B044	18532283	SPRING	1
B501	18533031	SCREW B	1
B020	18533062	TABLE ROCK A	1
B021	18533071	TABLE ROCK B	1
B022	18533081	TABLE LIMITER	1
B005	18534101	SPRING	1
B001	18610093	CUSHION	4
B023	18610341	GUIDE READ	1
B029	18610421	MAGNET RUBBER	1
B030	18610431	STOPPER CUSHION	2
PA01	87868101	SERVO PWB FULL ASSY	1
	*** RESISTORS ***		
⚠ R514	5102-4R75711	R,FUSE 4.7H 1W 5%	1
⚠ R19A R19B R260 R261 R262 R263	5102-4R74713	R,FUSE 4.7H 1/4W 5%	6
R619	5134-150J25P	R,CARBON 15H 5% 1/4W	1
R141 R160 R622	5134-220J25P	R,CARBON 22H 5% 1/4W	3
R510 R511 R512 R513	5102-2R74713	R,FUSE 2.7H 5% 1/4W	4

HD500 (EW)

SYMBOL			PARTS NO	DESCRIPTION	QTY
R617	R618		5134-270J25P	R,CARBON 27H 5% 1/4W	2
R226	R307	R308	5134-470J25P	R,CARBON 47H 5% 1/4W	3
R121	R168	R201	5134-101J25P	R,CARBON 100H 5% 1/4W	6
R349	R350	R506			
R601	R602	R603	5134-181J25P	R,CARBON 180H 5% 1/4W	8
R604	R605	R606			
R607	R608				
R113			5102-2214713	R,FUSE 220H 5% 1/4W	1
R110	R323	R324	5134-331J25P	R,CARBON 330H 5% 1/4W	9
R337	R338	R347			
R348	R389	R390			
R127	R209	R248	5134-471J25P	R,CARBON 470H 5% 1/4W	8
R264	R610	R612			
R614	R616				
R118			5134-561J25P	R,CARBON 560H 5% 1/4W	1
R179	R183	R319	5134-102J25P	R,CARBON 1.0K 5% 1/4W	6
R320	R374	R624			
R315	R316	R392	5134-122J25P	R,CARBON 1.2K 5% 1/4W	3
R111	R175	R181	5134-152J25P	R,CARBON 1.5K 5% 1/4W	7
R333	R334	R335			
R336					
R130			5134-162J25P	R,CARBON 1.6K 5% 1/4W	1
R176	R220	R246	5134-222J25P	R,CARBON 2.2K 5% 1/4W	3
R152			5134-272J25P	R,CARBON 2.7K 5% 1/4W	1
R117	R211	R223	5134-332J25P	R,CARBON 3.3K 5% 1/4W	6
R239	R313	R314			
R107	R108	R339	5134-392J25P	R,CARBON 3.9K 5% 1/4W	6
R340	R341	R342			
R124	R133	R137	5134-472J25P	R,CARBON 4.7K 5% 1/4W	16
R185	R186	R188			
R199	R208	R229			
R245	R317	R318			
R321	R322	R407			
R507					
R196	R391		5134-562J25P	R,CARBON 5.6K 5% 1/4W	2
R114	R115		5134-622J25P	R,CARBON 6.2K 5% 1/4W	2
R10C	R10D	R101	5134-682J25P	R,CARBON 6.8K 5% 1/4W	13
R109	R139	R214			
R216	R217	R301			
R325	R326	R327			
R328					
R329	R330	R331	5134-822J25P	R,CARBON 8.2K 5% 1/4W	4
R332					
R10B	R102	R112	5134-103J25P	R,CARBON 10K 5% 1/4W	38
R119	R136	R142			
R144	R149	R163			
R165	R170	R171			
R173	R178	R189			
R194	R195	R202			
R227	R228	R241			
R242	R249	R250			

HD500 (EW)

SYMBOL			PARTS NO	DESCRIPTION	QTY
R367	R368	R383	5134-103J25P	R,CARBON 10K 5% 1/4W	38
R384	R397	R404			
R406	R418	R609			
R611	R613	R615			
R701	R702				
R703	R704		5134-113J25P	R,CARBON 11K 5% 1/4W	2
R174			5134-123J25P	R,CARBON 12K 5% 1/4W	1
R177	R251	R252	5134-153J25P	R,CARBON 15K 5% 1/4W	5
R705	R706				
R129			5134-183J25P	R,CARBON 18K 5% 1/4W	1
R10A	R132	R134	5134-203J25P	R,CARBON 20K 5% 1/4W	8
R166	R167	R198			
R206	R207				
R125	R210	R218	5134-223J25P	R,CARBON 22K 5% 1/4W	8
R219	R221	R222			
R224	R238				
R105	R106	R161	5134-273J25P	R,CARBON 27K 5% 1/4W	3
R187	R386		5134-333J25P	R,CARBON 33K 5% 1/4W	2
R123	R151	R155	5134-393J25P	R,CARBON 39K 5% 1/4W	7
R158	R172	R190			
R191					
R116	R140	R148	5134-473J25P	R,CARBON 47K 5% 1/4W	11
R154	R162	R180			
R203	R237	R369			
R370	R410				
R143	R182		5134-563J25P	R,CARBON 56K 5% 1/4W	2
R234	R247		5134-683J25P	R,CARBON 68K 5% 1/4W	2
R138	R204	R385	5134-823J25P	R,CARBON 82K 5% 1/4W	3
R126	R135	R153	5134-104J25P	R,CARBON 100K 5% 1/4W	24
R164	R169	R193			
R205	R215	R230			
R231	R232	R235			
R371	R372	R388			
R401	R402	R403			
R405	R408	R414			
R415	R416	R417			
R145	R225		5134-124J25P	R,CARBON 120K 5% 1/4W	2
R122	R197	R244	5134-154J25P	R,CARBON 150K 5% 1/4W	5
R373	R621				
R258			5134-224J25P	R,CARBON 220K 5% 1/4W	1
R131			5134-244J25P	R,CARBON 240K 5% 1/4W	1
R243			5134-364J25P	R,CARBON 360K 5% 1/4W	1
R159			5134-394J25P	R,CARBON 390K 5% 1/4W	1
R192			5134-474J25P	R,CARBON 470K 5% 1/4W	1
R146	R233	R236	5134-564J25P	R,CARBON 560K 5% 1/4W	3
R147			5134-824J25P	R,CARBON 820K 5% 1/4W	1
R156	R381	R382	5134-105J25P	R,CARBON 1.0M 5% 1/4W	3
R157			5134-115J25P	R,CARBON 1.1M 5% 1/4W	1
R150			5134-225J25P	R,CARBON 2.2M 5% 1/4W	1
R240			5102-1R5579	R,FUSE 1.5H 5% 1/4W	1
R343	R344	R345	5102-4R74713	R,FUSE 4.7H 5% 1/4W	4
R346					
R365	R366		5102-1004713	R,FUSE 10H 5% 1/4W	2
R707	R708		5102-1814713	R,FUSE 180H 5% 1/4W	2
R623			5102-2214713	R,FUSE 220H 5% 1/4W	1

HD500 (EW)

SYMBOL			PARTS NO	DESCRIPTION	QTY
R501	R502	R503	5102-4714713	R,FUSE 470H 5% 1/4W	5
R504	R505				
R303	R304	R305	5102-6814713	R,FUSE 680H 5% 1/4W	5
R306	R387				
R508	R509		5102-1024713	R,FUSE 1.0K 5% 1/4W	2
R184			40933068	R,METAL 120H 5% 2W	1
		***	CAPACITORS	***	
C524			42019575	C,CERAMIC 500V 0.01UF	1
C102	C127	C131	5361-473ZF	C,CERAMIC 50V 0.047UF	10
C132	C133	C134			
C219	C401	C499			
C602					
C226			5361-103ZF	C,CERAMIC 50V 0.01UF	1
C139	C140	C141	5361-473ZF	C,CERAMIC 50V 0.047UF	3
C113	C114		5361-100DSL	C,CERAMIC 50V 10PF	2
C110			5361-330KSL	C,CERAMIC 50V 33PF	1
C109	C116	C407	5361-101KSL	C,CERAMIC 50V 100PF	3
C408			5361-151KSL	C,CERAMIC 50V 150PF	1
C105	C106	C203	5361-391KSL	C,CERAMIC 50V 390PF	3
C402	C403		5361-330KSL	C.CERAMIC 50V 33PF	2
C217			5361-101JCH	C,CERAMIC 50V 100PF	1
C207	C218		5361-151JCH	C.CERAMIC 50V 150PF	2
C142			5361-151KSL	C,CERAMIC 50V 150PF	1
C225			5361-221KSL	C,CERAMIC 50V 220PF	1
C235	C236		5361-220JCH	C,CERAMIC 50V 22PF	2
C211			5353-221535	C,MICA 50V 220PF	1
C128	C129	C130	5361-223N913	C,CERAMIC 16V 0.022UF	6
C135	C136	C138			
C210	C521		5354-102J1HM	C,FILM 50V 1000PF 5%	2
C221	C222		5354-122J1HM	C,FILM 50V 1200PF 5%	2
C208			5354-152J1HM	C,FILM 50V 1500PF 5%	1
C220	C223		5354-222J1HM	C,FILM 50V 2200PF 5%	2
C201	C214	C606	5354-332J1HM	C,FILM 50V 3300PF 5%	3
C115			5354-822J1HM	C,FILM 50V 8200PF 5%	1
C118	C119	C202	5354-103J1HM	C,FILM 50V 0.010UF 5%	7
C212	C406	C603			
C610					
C107	C209		5354-223J1HM	C,FILM 50V 0.022UF 5%	2
C604			5354-333J1HM	C,FILM 50V 0.033UF 5%	1
C103	C206		5354-104J1HM	C,FILM 50V 0.10UF 5%	2
C1			42910036	C,CERAMIC 400V 4700PF	1
C108	C120		4297F729	C,FILM 50V 0.22 UF 5%	2
C117			4297F731	C,FILM 50V 0.33 UF 5%	1
C313	C314		5359-3315851	C,FILM 50V 330PF	2
C319	C320		5359-6815851	C,FILM 50V 680PF	2
C325	C326		5359-1025851	C,FILM 50V 1000PF	2

HD500 (EW)

SYMBOL			PARTS NO	DESCRIPTION	QTY
C309	C310		5359-3925851	C,FILM 50V 3900PF	2
C335	C336		5359-6825851	C,FILM 50V 6800PF	2
C311	C312		5359-5035851	C,FILM 50V 0.05UF	2
C522	C523		5345-1045931	C,FILM 50V 0.1UF	2
C605	C608		5345-106C041	C,ELEC 16V 10UF	2
C607	C609		5345-476B041	C,ELEC 10V 47UF	2
C405			5345-476B041	C,ELEC 10V 47UF	1
C215	C299	C517	5345-227B041	C,ELEC 10V 220UF	4
C518					
C515	C516		5345-476D041	C,ELEC 25V 47UF	2
C101	C123	C137	5345-107D041	C,ELEC 25V 100UF	8
C213	C216	C227			
C228	C229				
C409			5345-474F041	C,ELEC 50V 0.47UF	1
C350			5345-335F041	C,ELEC 50V 3.3UF	1
C338	C404		5345-475F041	C,ELEC 50V 4.7UF	2
C104	C122	C204	5345-106F041	C,ELEC 50V 10UF	4
C339					
C303			5345-227A041	C,ELEC 6.3V 220UF	1
C305	C306	C307	5345-227B041	C,ELEC 10V 220UF	4
C308					
C321	C322	C323	5345-227C041	C,ELEC 16V 220UF	6
C324	C513	C514			
C301	C302		5345-477C041	C,ELEC 16V 470UF	2
C507	C508		5345-228C041	C,ELEC 16V 2200UF UTCS	2
C504	C505		5345-107D041	C,ELEC 25V 100UF	2
C501	C502		5345-228D041	C,ELEC 25V 2200UF	2
C205	C224		5342-105F0951	C,ELEC 50V 1UF	2
C121			5345-226D041	C,ELEC 25V 22UF	1
C111			5345-476C041	C,ELEC 16V 47UF	1
C112			5345-475D041	C,ELEC 25V 4.7UF	1
C126			5345-105F041	C,ELEC 50V 1UF	1
C519	C601		5345-477A041	C,ELEC 6.3V 470UF	2
C511	C512		5345-108B041	C,ELEC 10V 1000UF	2
C124	C125	C337	5134-227C041	C,ELEC 16V 220UF	5
C701	C702				
C506	C509	C510	5134-108C041	C,ELEC 16V 1000UF	3
C503			5134-228C041	C,ELEC 16V 2200UF	1
C230	C231		5134-227E041	C,ELEC 35V 220UF	2
C238			5345-335F041	C,ELEC 50V 3.3UF	1
C315	C316	C317	5345-476C0951	C,ELEC 16V 47UF	8
C318	C327	C328			
C329	C330				
C234			5345-22D0951	C,ELEC 25V 22UF	1